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What the Convoy System Has Taught

**A Lesson in Sea Power to Which America is Only Half
Awake — Events Demand Definite Maritime Policy**

(Written on Board a United States Transport Enroute to England)

SEA power must be seen to be appreciated. Statistics showing the number of men and tons of war material transported from America to France per month or year, figures giving the arrivals and departures from British ports, even diagrams which graphically contrasted the ascending curve of merchant-ship construction with that rapidly falling line representing submarine successes, although they have afforded a vivid conception of the workings of sea power in the war against German savagery, cannot carry the conviction that results from a single voyage across the Atlantic at the present time, when many outward semblances of war conditions are still in evidence. If this conviction only could be transmitted with undiminished force to the whole American people, a problem with which business leaders and statesmen have been laboring for generations would be solved. The United States would then be assured a permanent merchant marine and naval force proportionate to its needs and responsibilities as a great nation.

The Vanished Fleet

The ever-changing, trackless sea is the highway for the world's traffic and that nation which cannot maintain its rights on this great thoroughfare must sink to the level of a third-rate power. Most vividly is this thought driven home by a voyage across the ocean under war conditions. Over the entire splendid, seemingly limitless expanse of water that covers the globe, not a single German merchantman, not a solitary Hun naval vessel, nor even a few skulking U-boats, can be found. The gates to the seven seas are closed to the Hohenzollerns. Yet over this same glittering fairway plough thousands of big ships, sailing singly or in great convoys of from 20 to 50 vessels. These steamers are carrying the greatest traffic ever known to the Atlantic; and life on board them all goes on practically the same as it did in the heyday of peace, even down to the time-honored

ship's concert! Recently a single mixed convoy leaving New York carried as many soldiers as were in the entire American army before the Spanish war, to say nothing of scores of civilians, men, women and children, and thousands of tons of cargo.

The Lesson of the Convoy

Modern sea power is epitomized in the convoy system. It is at once an impregnable bulwark against the submarine, and a test in seamanship and navigation that again justifies our Anglo-Saxon heritage of maritime supremacy. By day almost unreal by virtue of the precision of their movements, painted ships on a painted ocean; by night leaving not even the trail of a ghost in the black void, our convoys have brought victory to the allied armies in France. The convoy system is sea power organized.

Let us con thoroughly this great lesson of the war. For in the days of peace to come, sea power must also be organized to be effective. There must be unity of effort behind our shipping policy. The problem now is to bring this thought home to the American people and to imbue them with a consciousness of the necessity for maritime force in both peace and war—to the end that the sea power the United States is raising up may stand permanently.

To this great task the chairman of the United States shipping board already has addressed himself. It is a task worthy of a genius. A little progress has been made, and various national societies, at Mr. Hurley's request, have appointed standing committees to stimulate interest in an American merchant marine after the war. But much remains to be done, and in the work that lies ahead the great shipbuilding and their allied interests of the United States should take a leading part. England is already far on the road. Her people know sea power. On fundamentals, their councils are undivided. America has yet to educate its people and establish a maritime policy. Let us learn well and quickly the lesson of the convoy.

TO FEED EUROPE

Need to Provision Old World is First of New Demands Imposed by Peace

PREMATURE enthusiasm caused by the signing of the armistice has been met by a cool realization on the part of shipping men that the ocean tonnage emergency is not yet over. Furthermore it does not promise to be over for a year yet, although some encouragement has been found during the past few weeks in the fact that freights are accepted more freely. An easing up in the enormous war shipments will release much space on the Atlantic and already more accommodations can be had at eastern ports.

The British ministry of shipping has permitted the resumption of sailings of the Ellerman's Wilson line from New York to Hull. For war reasons the regular sailings of the line from New York and Boston to Hull were discontinued in the spring of 1918 and a service from Philadelphia to Hull substituted. The service from New York was resumed because of the removal of the strain at that port due to active war prosecution. The Wilson liners, however, are still under British government control and they will be required to carry a certain percentage of government freight. The line will probably not have any free space to offer for some time yet.

Undue optimism was also caused by the announcement of the removal of the export embargoes by the railroad administration in November last. Outstanding permits for shipment to seaboard were cancelled, and future railroad permits, it was said, will be issued on goods intended only for immediate overseas movement. Preference is to be given the movement of foodstuffs, particularly for the Belgian relief commission and for neutral countries. Facilities are to be provided for the rapid movement of some heavy shipments of clothing for Belgium and northern France.

Shipping Bans Will Continue

Shipping firms are confessedly somewhat disappointed over the delay in removal of the war restrictions. Everyone anticipates that the end of the war will bring about better conditions but is unable to prophesy with any accuracy when that will be. A considerable saving will be made when the convoy system is dropped, but the allies do not as yet appear to be in any hurry to make the change. There has been shown a greater freedom at the American ports; passengers for Europe are being booked; sailings are being announced and the censorship on many of the interesting details of shipping is not nearly so strict as formerly. This situation, however, has merely given rise to much speculation but little tangible relief.

One anonymous authority expressed his belief that

the government would shortly release some vessels to private operators so that they could be placed in trade with South America. This is an outcome that is confidently expected but it may not come until the military situation is entirely cleaned up. The British, at least, have taken no chances with the Germans and have been holding themselves in readiness for any fresh outbreak of Hun atrocities on the high seas. The breaking off of the negotiations for the sale of the White Star liners owned by the International Mercantile Marine, which a British syndicate has been desirous of purchasing, was another thing which gave American shippers confidence. If the United States government is to obtain these vessels they will undoubtedly be used to bring American troops back from Europe. That would relieve the strain upon present American ships and make possible an earlier restoration of normal shipping conditions. Dutch shipping is apparently in a better condition today than it was prior to the war, but the bulk of the Dutch ships are under charter to the allied govern-

Removes Ban on Ships for Private Account

ANNOUNCEMENT was made Dec. 6 by the United States shipping board that American shipbuilders may accept contracts for the building of wooden vessels either for domestic or foreign account without the necessity of making any prior application for permission to the shipping board. In other words, so far as wood ship construction is concerned the American shipbuilder is now in a position to solicit and accept orders and carry forward the work of construction and to enter into contracts for the sale of such ships on completion without restraint.

The same action was announced with reference to the building of steel ships on domestic orders. It does not embrace or apply to foreign orders for steel tonnage.

Bainbridge Colby of the shipping board said that the board's action was not dictated by any special considerations, but was merely evidence of the progressive release of business from war time restrictions. "The burden of proof," said he, "is upon the proposed restriction or restraint in these days, and it will be the endeavor of the shipping board as rapidly as is consistent with the public interest to conduct the business subject to its regulation into unfettered operation through normal channels. This, however, cannot be accomplished all at once, but I can say to the shipping men of the country that it is the objective which the board is keeping before it as a guide in its decisions."

This action has been urged for several months, particularly by wood shipyards on the Pacific coast. These plants have been compelled to refuse a number of flattering offers from foreign buyers, anxious to place contracts for wooden ships. Most of this business, as a result, has gone to British Columbian yards where extra facilities are being installed to meet the demand.

Experts in This Country and Abroad

ments. It is reported that the capital of the more important Dutch shipping firms has increased from 98,034,000 florins in 1913 to 123,635,000 florins, their liabilities have decreased from 30,586,000 florins to 28,054,000 florins; their reserve funds have

increased from 28,405,000 florins to 148,555,000 florins; while their fleets consist of 307 vessels of 1,089,638 gross tons, against 277 vessels of 908,386 tons

prior to the war. The improved financial condition of Dutch shipping is believed to be but typical of that of most neutral vessel owners. They have profited considerably from the war and will continue to profit so long as the economic emergency lasts. Neutral ships under charter to the United States and the allies will remain so for six months after the war. This is a provision contained in all the charters no matter whether they are held by England or by the United States. The period of the war, of course, is determined by the day of signing the peace treaty. It would appear therefore that the shipping board will have jurisdiction over a large neutral tonnage until

Europe Leads in Rush for Brazil's Trade

Cable from American chamber of commerce of Rio de Janeiro, Brazil, to chamber of commerce of United States, Washington.

WE respectfully request your earnest consideration at Atlantic City of following measures urgently required for the reconstruction and maintenance of American trade with Brazil: Immediate allocation of sufficient tonnage to insure prompt shipments of all pending orders which unless forwarded immediately will be cancelled at great loss to American export trade and substituted by European goods now offering at lower prices under practical guarantee of immediate delivery; immediate establishment of regular and frequent steamship service from the United States to Brazilian ports to insure maintenance of established trade in coal, fuel oil, cement, lubricants, iron and steel products and other merchandise, also to move coffee, manganese and other Brazilian products sold and awaiting shipment; that freight rates should be controlled by the United States government so that they be on a parity with those from Europe.

"Present rates from Liverpool to Rio de Janeiro, 60 shillings (\$14.40); New York to Rio de Janeiro, \$35. Seven fast freight steamers arrived last month from England, three from continental Europe, 10 small schooners from United States. British lines announce schedule departure this month three fast freight steamers from Brazil to Europe, French lines seven steamers, Lloyd Brasileiro has diverted three large steamers from United States to European service. Norwegian and Holland lines advertise re-establishment fast service to Europe this month. Nothing definitely announced or expected from or to the United States. No mail has arrived for a month."

STATE CONTROL

Allies Expect to Continue Firm Hold on Shipping for Many Months

late in 1919. That seems a long time but some officials are afraid that even that may not be long enough. The officials of the government are not anxious to discuss the probable termination of these charters because they do not see any cessation of the shipping emergency and the government, they contend, will be compelled to continue its control until the emergency is entirely past.

It has been reported that the government is arranging to release all oil tank steamers, aggregating 1,600,000 tons, which were taken over as a war emergency. With the surrender of the German fleet and the withdrawal of German submarines from the high seas, it is not necessary longer to maintain such a strong patrol of European waters. The British oil-burning ships will be able to obtain fuel from the East and American destroyers will soon be coming home. The tankers therefore are in less demand than previously. During the war these ships, under convoy, made the round trip across the Atlantic in a little more than 50 days. In ordinary times, and without convoy, they make the round trip in 36 days. The release of these vessels, therefore, will enable them to perform more efficient work.

Aside from the fact that the war traffic will let up, the signing of the armistice was expected to release a great many ships to the world's trade. E. N. Hurley, chairman of the shipping board, estimated that about 1,200,000 tons of additional shipping have been provided. Of this 250,000 tons represent the German ships tied up in German or neutral ports. In addition there are many neutral ships which were tied up in Japanese and other ports because of the submarine danger, and these will be turned back to trade. It requires a little time for the charter market to feel the effect of these releases and a few weeks will naturally pass before the ocean freight movement is greatly affected thereby.

Food Needs Crowd Tonnage

The immediate advantage accruing to American shipping from the armistice is likely to be absorbed by the requirements for food shipments. American grain has long been overflowing the elevators in the East because of the abnormal tonnage shortage this past summer and fall. This grain must be moved. Furthermore the United States has a food agreement with Holland for which ships are needed. Sweden, Norway, Denmark and Spain are also badly in need of supplies, it is said, and tonnage must be reserved for transporting these. The shipping board is planning to place 100,000 tons of shipping in this food service. England and France, it was said, will divert ships for this trade.

-From the food administration has come the announcement that the United States must ship approximately 20,000,000 tons of food to Europe during the coming year. This is practically the limit of loading capacity at our ports.

"The magnitude of this undertaking," it was stated officially, "may better be understood in comparison with our prewar exports of less than 6,000,000 tons per year and the export last year of only 11,820,000 tons."

Carrying out the plans of rehabilitation of Russia the war trade board has organized a company to engage in the business of exporting to Russia and Siberia agricultural implements, shoes, clothing and other commodities which the Russian population needs, bringing back Russian and Siberian raw materials in return. Three ships loaded with supplies for Russia have already been negotiated for. Others will follow. The cargoes will be shipped across the Pacific to Vladivostok and this trade, in the future, is likely to make considerable demands upon the available tonnage space.

Exporters say that they already find a more liberal supply of tonnage, but an examination will show that the space offered is almost exclusively for essential goods going to Europe. Space can be found for goods which are essential to the economic situation abroad, but there exists the same difficulty as always in finding space for luxuries or for shipments to outlying markets.

The fact remains that the merchant tonnage of the world is short. There will be a tonnage shortage for some time after the peace proclamation. The demand for tonnage is expected to be incessant for probably two years and during that time the shipyards of the world will be kept busy. If the Emergency Fleet corporation does not let sufficient contracts to keep all American yards busy, foreigners will be clamoring for permission to let contracts here. Inquiries for shipping are said to be coming from most of the maritime countries, but American builders have been unable to take any of them as yet.

Merchant Tonnage is Short

"If the war had not come," declared Chairman Hurley of the shipping board upon the eve of his departure for England, "the estimated normal increase in the world's merchant marine would have been (from Aug. 1, 1914, to Dec. 1, 1919) 19,740,000 deadweight tons. Merchant marine losses, actual and estimated, for the time between the same dates, are placed at 28,390,447 tons. And what during this period will have been the construction of ships? Not including enemy countries it figures, actual and estimated as probable, 32,558,630 deadweight tons, by the end of the year 1919. There will then be, according to this computation, a net deficit due to the war of 15,571,817 tons. By 1920 the deficit will reach nearly 20,000,000 tons.

"Our export trade has already grown by great bounds. In the four fiscal years preceding the war the total foreign trade of the United States was \$15,972,000,000. In the four fiscal years since the war it has increased to \$29,232,000,000. Our imports for those two periods have increased from \$6,887,000,000 to \$9,558,000,000. Our exports during the same time have increased from \$9,085,000,000 to \$19,674,000,000, and this notwithstanding the fact that our exports of cotton decreased about 33 per cent because of Germany, Austria and some other coun-

tries being shut out of the market. True, in stating these great totals, mention must be made of the fact that on the average money values have risen 50 per cent, but even with this allowance, our exports have greatly increased not only to Europe but to other countries."

Continue Federal Control

Between April 6, 1917, the date of the declaration of war by the United States, and Nov. 11, 1918, the date of the armistice, a total of 2985 merchant vessels were built in American yards, representing 3,091,695 gross tons. Of these but 506 were ocean-going steel ships, aggregating 2,038,814 gross tons. An increase in ocean-going ship production at all commensurate with the requirements of peace trade will require a stupendous effort on the part of the United States. Unless congress interferes this production will continue for the account of the government, and the government will continue to try to man these ships with American crews. The recruiting service of the shipping board has called for 5000 volunteers for the merchant marine service. The training ships will continue in use and the high wages held out as inducements will not be diminished.

This is undoubtedly one way of providing the tonnage to meet the requirements of peace trade, but shipping men are not at all satisfied with the outlook. In shipping circles much apprehension is expressed over the tendency toward government ownership and operation as a permanent policy. Traditionally the fear of nationalization of American shipping and the use of all their influence against the perpetration of such a policy upon this country. English shippers have always been fearful of the same thing in Great Britain and even the promises made recently by A. Bonar Law to parliament that British shipping would be returned ultimately to private ownership has not entirely allayed this fear.

Pacific Rates are Unsettled

The situation in the Oriental trade out of North Pacific ports is most chaotic at the present time. Owing to the embargoes by the United States on imports, space eastbound is going begging at from \$6 to \$7 per ton, whereas it was until recently from \$50 to \$55 per ton. On the other hand, as the result of the lack of import freight rates on exports to the Orient have advanced to \$50 per ton and space is in urgent demand. There has been a marked decrease in the number of steamers coming from the Orient, consequent upon this policy and Japanese owners are diverting their vessels to more profitable routes, particularly in the Indian trade, where good rates, based on supply and demand, are being paid.

As an illustration, cargo is being brought to Seattle from Japan for around \$7 per ton, a distance of 4,000 miles or a 20-day run. Japanese freighters are getting \$15 per ton for carrying coal from Calcutta to Colombo, a distance of 1231 miles or a 5-day run.

This situation has resulted from the war trade board's orders prohibiting imports of rice, beans, peas and other commodities from the Orient. Recent indications are that these restrictions will now be lifted. Showing the condition, the steamer SENECA, engaged in operating between Seattle and Singapore, has been unable to get return cargo so that for several months the owners have operated the vessel on a coastwise route from Hongkong, south.

Saving Time in Steel Shipbuilding

Development of Use of Electric Welding in Steel Shipyards Has
Shown Where This Method Can be Applied to Best Advantage

By J. H. Anderton

THERE are a number of features involved in the application of welding to ship construction which do not ordinarily apply to the usual and normal fields of welding. In the locomotive shops, the personnel directly concerned is the master mechanic, chief engineer and similar officials, who among themselves decide as to the usefulness and general applicability of welding. Mistakes are rectified as the work proceeds and new applications are found. The same thing takes place in a large number of munition shops where bombs, grenades, etc., have been successfully welded in large quantities.

These features, however, are not so simple when applied to the present-day shipbuilding program. Practically all ships being built in the United States at the present time are directly or indirectly under the control of the government and the interests affecting the application of welding to the vessel in any of its parts may be put as follows:

1. The personal interest of the yard constructing the vessel to see that all parts are securely and properly put together to the end that the vessel shall finally reflect full credit to its constructor. This is identical with the interest of railroads, manufacturers and others.

2. The interest of the representatives of the United States shipping board as representing the owner, to the end that the owner shall receive a good vessel.

3. The interest of Lloyds Register of Shipping and the American Bureau of Shipping, which are identical.

Approve Certain Work

Lloyds Register and the American Bureau of Shipping have jointly issued a circular letter embracing a certain number of parts in the vessel where electric welding will be approved. It is expected that this list of items will be added to as recommendations are made by the various shipyards and other welding interests, dependent upon the judgment of the classification societies as to their safety. There are hundreds of places aboard vessels which have not been specifically embraced in the list published by the classification societies, but which, however, can be assumed as embraced in this approved list.

When the welding engineer in any shipyard decides that he sees some particular operation in the construction of a vessel which could be more suitably performed by welding than by the usual methods, the following procedure is necessary:

1. The approval must be obtained of the structural engineer or other

official having jurisdiction over such matters in general in the yard concerned.

2. Note must be made to see if this operation has been embraced in the classification societies' list. If examination discloses the fact that it has not been embraced, it is necessary to take this up as a specific item to be passed on by both societies.

3. It is necessary to take this item up, in most cases, with the authorized representative of the United States shipping board for his judgment and approval.

Too Much Red Tape

The writer personally feels that this method of procedure is at the present time one of the greatest obstacles to the application of electric welding on the present shipbuilding program for the difficulty of and time consumed in, obtaining approval upon each specific item in the manner just outlined is disheartening and tends to prevent the automatic operation of methods that have proved satisfactory in a large number of cases.

Shipbuilders, however, have been proceeding along established lines of practice for a number of years. This practice has proved to be satisfactory and it is to be expected that a certain amount of caution will be exercised on their part in the substitution of any method for an established and satisfactory system.

While spot welding is embraced in these discussions of the application of welding to ships, no spot welded parts of steel ships have been specifically approved by the classification societies. One reason for this may be found in the fact that until recently large spot welding machines were not generally in use in this country. There are, however, a number of machines now in the process of manufacture and it is expected that as experiments proceed with the actual machines it will be demonstrated to all parties interested that spot welding can supersede riveting, particularly in fabrication shops, to a large extent.

There are at the present time a large number of places in vessels where spot welding can be applied without the necessity of consulting the classification societies. These are the portion of the construction members of the vessel which are not capital parts of the ship, such as crew's nests, smokestacks, uptakes, ventilators, cowls and stacks, internal ventilation ducts, skylight framings, stair treads, stringers and certain watertight and nonwatertight bulkheads. As a matter of fact, a large amount of this work is already being spot welded, particularly the parts of fabricated skylights.

Experiments have also been made with spot welding of watertight doors and this is permissible under the definite restrictions of the classifica-

tion societies. The time saved by the full application of spot welding in all its possibilities to the parts alone, not particularly affected by the classification societies, is enormous.

The four fundamental points which effect time saving by welding in ship construction are: First, an intimate knowledge of, and a proper attitude toward, the application of welding by the designing forces in the drafting room; second, welding equipment in the shops and its flexibility as applied to the work; third, welding equipment and distribution system on the ways for the vessels themselves and, last of all, good welders and good welds.

In discussing with the designing forces the various items where welding can be applied on vessels, particularly with the men in what is called "hull findings", the writer has been agreeably surprised to find that these men are actually anxious to find out all that is known about welding. Looking at it from their point of view it means, practically speaking, the entire absence of careful dimensions for punching and drilling and the substitution thereof of something which is placed in its proper position and stuck there. The future of electric welding as applied to ships will, in the writer's opinion, be determined largely by the attitude and general information and knowledge which the designers are able to obtain in connection with welding.

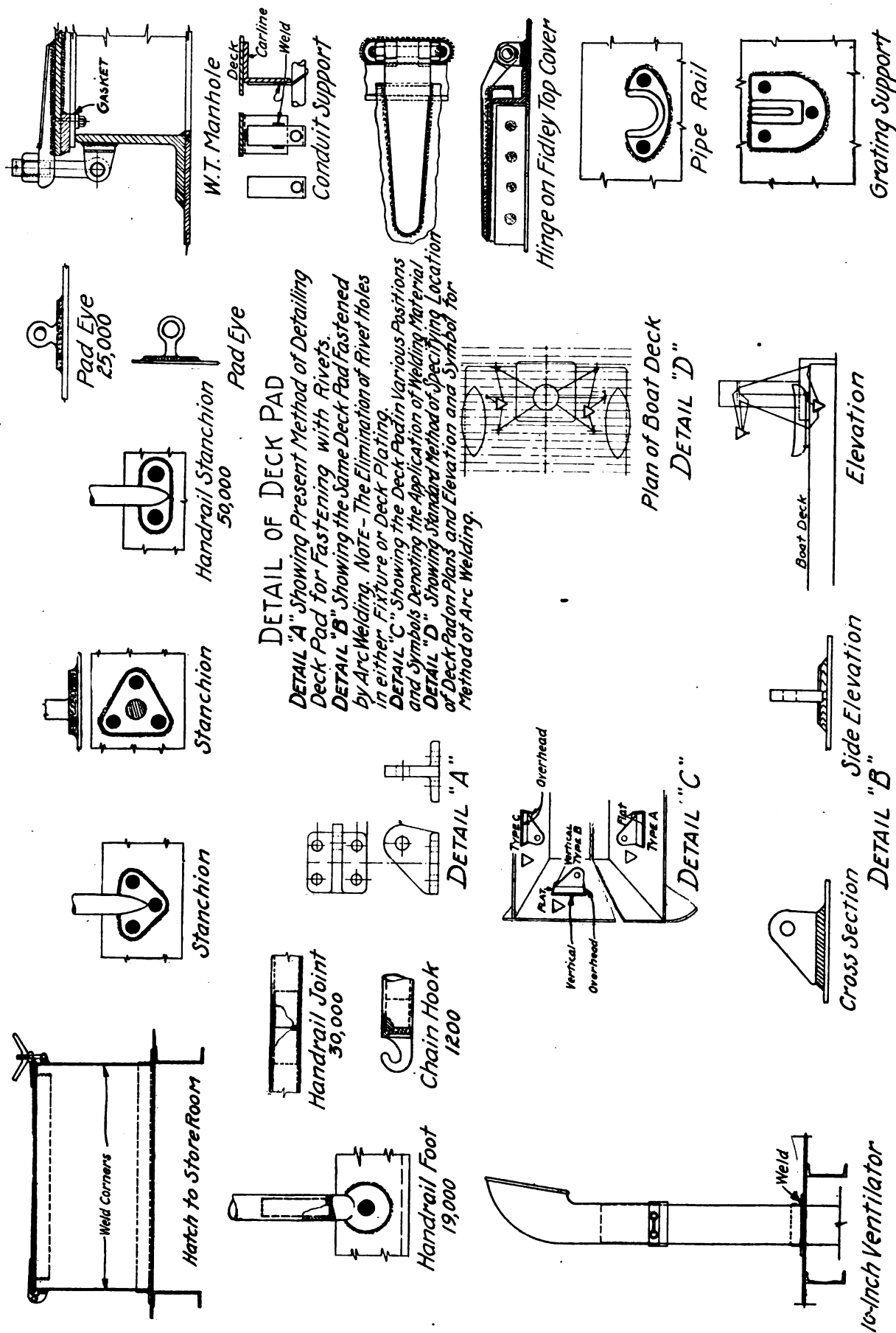
Work is Simplified

Anyone will recognize that it is a much simpler method in making up details for vessel construction and fittings to show any specific item located on an assembly drawing with no necessity for detailing the drilling or punching to be carried out in the shops. In an ordinary vessel there may be from 500 to 5000 of these items on which detailed drilling and punching could be eliminated and the items shown on an assembly drawing with the note "weld" attached thereto or the proper symbol shown. The item of time saving in this branch alone is considerable. The same remarks, of course, will apply to all detail drawings which are prepared for the fabrication work in the shops. The entire elimination of the detailing and the substitution thereof of the note "weld" or its equivalent would effect the same result in time saving.

On the assumption that the designing engineers are properly acquainted with the flexibility and value of welding in their work, the next step is to have on hand the proper equipment to carry out the work both at the shops and aboard the vessels. The design of the proper layout and the purchase of equipment for use both at the ships and in the shops is, in most cases, dependent upon the local conditions of the yard affected.

Hog island has been more or less

Third of a series of lectures on "Electric Welding" held at the Engineers' club, Philadelphia, under the auspices of the United States shipping board and published in *The Journal of the Engineers' club*. The author is electrical engineer, American International Shipbuilding Corp.



fortunate in this respect, since the plant is new and has not progressed in construction to a point beyond which it could not be changed or modified to suit the conditions required by electric welding. Since local conditions will, in nearly all cases, govern the layout of a shipyard, perhaps the best thing to say about that would be to describe the system at Hog island.

System is Extensive

The general system at this yard is served by two 66,000-volt, 60-cycle, 3-phase transmission lines terminating in a central substation of approximately 30,000 kilovolt ampere capacity. Three-phase feeders are carried from this substation for lighting and power on the 3-phase, 4-wire system with 4150 volts between phases. This permits the use of a standard 2300-volt apparatus while retaining the advantages of the 4150-volt distributing system.

In connection with the shops, these are located approximately three-quarters of a mile from the main substation. The group occupies a space approximately 1500 x 800 feet. A small substation is located near the center of the group. Power is stepped down from 4150 volts, 3-phase to 440 volts, 3-phase. At this voltage, it is used for all types of motors in the shops, cranes and one special case of direct-current motor generators for use with jig cranes.

For welding, 440-volt power is distributed to central cabinets located at convenient intervals on the walls of the shop. These cabinets contain fuses for usually about six or seven circuits. From the cabinets conduits are laid underground to various places in the shop and terminate in a 440-volt plug outlet. These outlets are located at sufficient intervals so that portable welders may be attached at any convenient place near the work.

In the plate and angle correction shop there is in course of erection an elaborate training center for welders. This center was installed under the auspices of the Emergency Fleet corporation and is capable of training 42 welders simultaneously. It is expected to use this center not only for training welders but as a production point where repetition work can be carried on advantageously.

The type of equipment which can be best used in the shops is somewhat dependent upon the local conditions. The layout at Hog island permits the use of either direct-current type of equipment or an alternating-current type from the same plugs.

Either the direct-current or alternating-current types of welder can be attached to the outlets at any place on the whole system. The voltage is 440 in all cases, however, so that if any of the resistance, reactance, series type of equipment is used, a transformer is necessary to reduce the voltage to a safe value. This type of equipment, as single portable units, has been given less consideration than others.

Coming now to the type and character of equipment for use aboard the ships, local conditions have again considerable influence. If the ways are fully protected from weather, water consideration can be given to portable rotating types. If the ways are exposed, the question can be

solved by several methods. Portable rotating machines can be used with protective covers and series resistance, reactance-type machines may be used in waterproof cases with a low voltage distribution, carried down the ways to a suitable termination. Alternating-current, portable transformer types of welders can be used. In two of these cases, that is, the direct-current, portable rotating type with protective cover or the alternating-current type, comparatively high voltage, 440 volts, may be carried down the ways to a suitable termination and the machines can be plugged in for use anywhere on the vessel.

At Hog island we have carried the 440-volt 3-phase system directly down the ways on each side of the vessel. Four outlets have been provided per

Ship Loss During War

LONDON reports that the world's total losses of merchant tonnage from the beginning of the war to the end of October, 1918, by enemy action and marine risk, were 15,053,786 gross tons. During the same period vessels totaling 10,849,527 gross tons were constructed and enemy tonnage totaling 2,392,675 tons was captured, making a net loss of tonnage during the war of 1,811,584 tons.

During the war 2475 British ships were sunk with their crews, and 3147 vessels were sunk and their crews left adrift. Fishing vessels to the number of 670 were lost during the period of hostilities and the merchant marine service suffered casualties exceeding 15,000 men.

British merchant tonnage losses were 9,031,828 gross tons. New construction in the United Kingdom in the same period was 4,342,296 tons; purchases abroad were 530,000 tons, and enemy tonnage captured was 716,520 tons. The net loss was 3,443,012 tons.

ship, the distance between the two outlets on each side being approximately 200 feet. In this way it is possible to use the same type of portable machines as is proposed for the shops, that is, either direct or alternating current.

Can Increase Load

The outlets as provided on the sides of the vessel are each capable of accommodating two welding machines. The maximum portable load, therefore, at the present time which could be accommodated per vessel would be eight. This could be increased to any reasonable degree without great difficulty.

The usual method of using types of machines either direct or alternating current at the ship is to locate the welding machine within a reasonable distance, say 30 to 40 feet, of the 440-volt plug outlet which is on the ways. The secondary lead is then carried from that point anywhere on the vessel. This method of handling leads of this character about a vessel for lighting and power, air lines, etc., is more or less familiar. The welding lead is carried in a similar manner, one terminal being attached to the hull of the vessel close to the welding

machine. One difficulty with this method is, of course, the occasional adjustment to the welding current value. It is considered the helper's duty to take care of this at the demand of the welder.

Good electric welders have heretofore been comparatively scarce due to the fact that electric welding has been almost exclusively used in railroad shops and a few similar places. Due to the efforts of the electric welding committee, it is expected that there will be a sufficient number of trained welders in the near future to carry out practically any program that may be devised.

Skilled Welders Are Necessary

Upon the men turned out by the training center of the Emergency Fleet corporation depends to quite an extent the future of electric welding. So many so-called welds, which have subsequently proved of absolutely no value, have been presented to men unacquainted with the art that the importance of good welders cannot be overestimated. Personally, the writer has seen sufficient to indicate that, provided good welders can be obtained, good ships can unquestionably be produced.

The illustrations indicate some of the welding that can be done in practically all shipbuilding yards. These sketches are more particularly applicable to the present A ships at Hog island, the drawings for which had been largely completed and the work placed in the fabricating shops previous to the formation of the electric welding committee.

The result is that a large amount of labor had already been performed on these drawings and nothing was to be gained by substituting welding, except in a few special cases where partial fabrication had to be done on the vessel itself. In the case where holes have been drilled or punched in the shop, but where companion holes have to be made on the ship the latter are being eliminated, the parts welded together, and the holes filled with welding material. In most cases this can be done at less than half the cost and time required to drill the holes. It is expected on the B vessels that practically all of the items shown in the illustrations, as well as many others, will be welded and designed as such.

The principal object of these sketches is to give an idea of the general parts where welding can be advantageously applied now. The direct question of how much time can be saved by welding methods as against the usual construction is, of course, dependent, first, upon the number of items welded and, second, on the character of the parts welded.

Assuming the cost of labor to be the same per hour, and the power required for welding as equal to the power taken by the air or electric drill which normally would be used, it may be said, in general, that the time saving effected by welding the types of equipment which are shown in the illustrations would not be less than 70 per cent of the time usually taken by old-established methods. This figure, of course, is not intended to apply to a completely welded ship.

The ship named after a mountain, the 9400-deadweight-ton DIABLO, first of 10 for the shipping board, was launched recently at the plant of the Pacific Coast Shipbuilding Co., on Suisun bay, California.

Famous Wreck Becomes Gunboat

How the Steamer Eastland Was Remodeled for Service in the United States Navy — Now Pronounced Staunch and Trim

By George H. Mark

KIPLING'S ship that found herself had an easy job compared with the steamer EASTLAND, which capsized into the mud of the Chicago river in July, 1915, and drowned 803 people. As the U. S. S. WILMETTE she is born again, dedicated to a new usefulness, her past wiped out and every stain against her name erased. From a despised and ostracized craft against whom every man's hand was turned, almost sentenced to be sunk in the depths of the Great Lakes, she has been transformed into what many naval men call the best gunboat of the United States navy.

The transformation is a romance. One man is responsible for it and he worked against handicaps and in the face of opposition, but firm in the conviction that he was on the right track.

After the capsized EASTLAND was righted and pumped out she was towed up the Chicago river in disgrace while counsel was taken as to her fate. The city was for sinking her in Lake Michigan but finally she was sold under the hammer for junk.

At this moment there appeared Capt. Edward A. Evers of the Illinois naval militia. He knows boats. He had faith that the EASTLAND was capable of better things and was not to blame for her great crime. He was able to obtain backing and bought the craft for \$46,000, to be remodeled into a training ship for the naval militia.

She was towed down Chicago river, with whistles of all craft along the way tooting in derision and was docked at the yards of the Chicago Shipbuilding Co., at South Chicago. Meantime congress appropriated \$175,000 to pay for the ship and to provide for her rejuvenation. It is of interest that the final cost has been only \$4000 over that figure.

The intention was to fit her for use on the lakes, but before she had been completed for that purpose the war opened for the United States and the government commandeered her for the

navy. The latter surveyed her and started further changes to fit her for salt water service. Shortly after the armistice was signed in France, orders were received to keep her on the lakes for a training ship and she will not see sea service after all.

Vessel is Now Safe

Much discussion took place at the time of her accident as to its cause. Whatever it was, the WILMETTE never can repeat the accident that befell the EASTLAND. Radical changes have been made in her proportions and equipment that have shifted her center of gravity to a point so low that she is unusually stable and every trace of "crankiness" that may have existed has been removed. Tests to determine the amount of list obtained under extreme circumstances of overloading have determined her unusual stanchness and trim.

The most marked outward change is the removal of the two upper decks. This gives the ship a much lower line and removes much of the top weight. A steel deck from prow to stern, except directly over the engines, has been built

4 feet above the tank top and masts have been built fore and aft between this deck and the tank top.

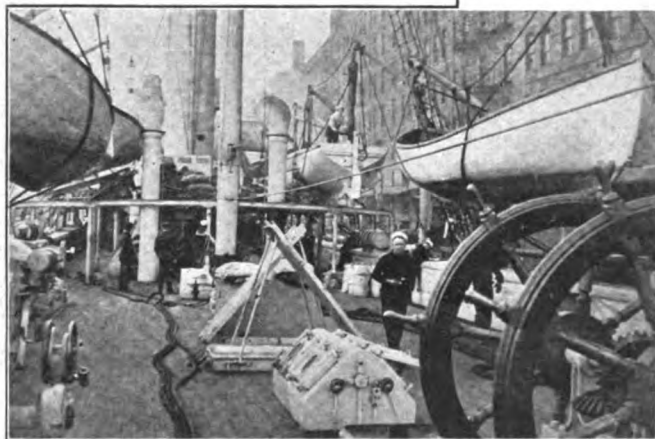
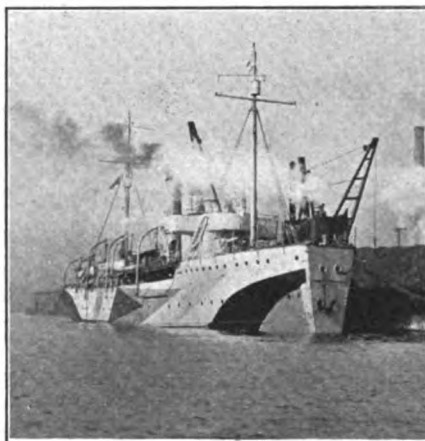
One of the forward boilers has been removed and the other shifted to center line. Coal bunkers have been built on each side of this boiler. Coal capacity thus is doubled and steaming radius has been increased 4000 miles. To provide for salt-water service, surface condensers, evaporators and copper tubing have replaced equipment suited only to fresh water use. Refrigerating plant has also been stalled.

Quarters for the men have been built forward and for the officers aft. A bridge and charthouse have been built, the former bridge having been removed with the upper decks. Four 4-inch guns have been mounted, the after battery being shown in the accompanying photograph of the quarterdeck.

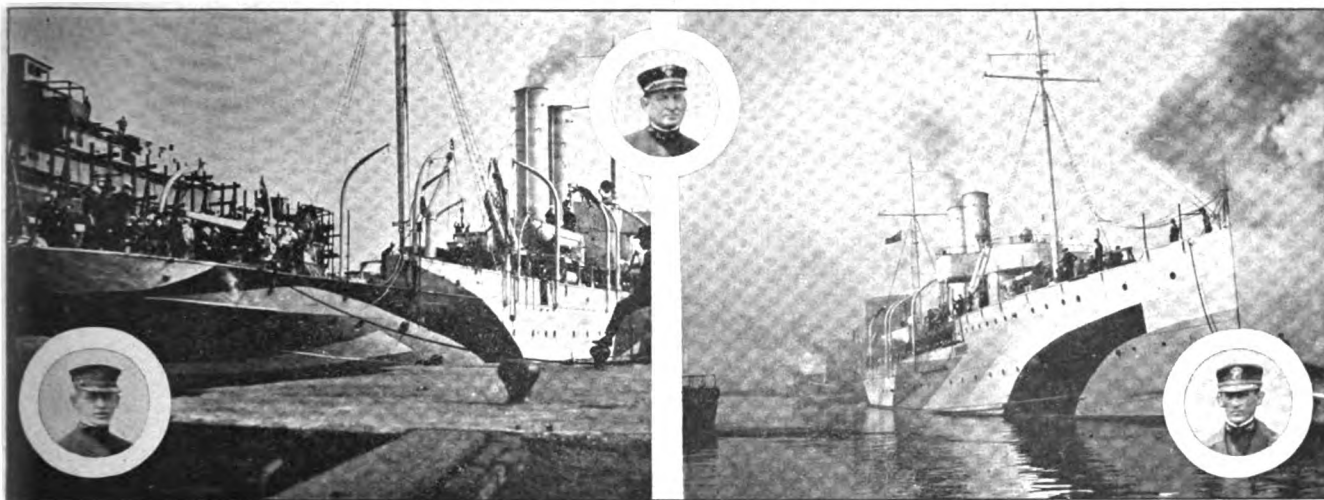
Steel skylights for the engine room quarters have been provided, all woodwork removed and steel ladders stalled. Boat stowage has been arranged in conformity with navy standards. Engines and boilers have been overhauled and new masts stepped.

When it was determined to use the WILMETTE on salt water, it was necessary to provide for her passage through the Welland and other canals on her way to the Atlantic. She was 272 feet long and it was necessary to reduce her to 256 feet. Therefore, 16 feet of bow has been removed and stowed in the fore and in the fore and in the fore bulkheaded. She now is ready to pass the obstacles between Chicago and the Atlantic. But this work will be placed at once for orders have just been received to keep the WILMETTE on fresh water and the bow will be restored.

The WILMETTE is of 2000 tons burthen. While she formerly made 22 knots an hour and was one of the fastest boats on the lakes, the removal of one boiler has reduced her speed to 16 or 18 knots, still ample, and more than



AT THE RIGHT IS SHOWN THE NEW BRIDGE AND CHARHOUSE—AT THE LEFT A DECK VIEW LOOKING FORWARD AFTER THE REMODELING COMPLETE—THE UPPER ILLUSTRATION SHOWS THE VESSEL'S BOW CUT AWAY TO PERMIT HER TO PASS THROUGH THE WELAND CANAL LOCKS ON THE WAY TO THE OCEAN



BOW VIEW OF GUNBOAT WILMETTE WHILE BEING FITTED FOR SERVICE ON THE GREAT LAKES AT THE RIGHT—AT THE LEFT, STERN AND QUARTER-DECK VIEW SHOWING 4-INCH GUN MOUNTED AFT—CAPT. EDWARD A. EVERS AT THE CENTER, AT THE RIGHT NAVAL CONSTRUCTOR T. W. RICHARDS, AT THE LEFT ASSISTANT NAVAL CONSTRUCTOR LEWIS S. HOWARD

gunboats can boast. In losing this speed, however, the added radius of cruising ability is a decided advantage. This is the first gunboat ever turned out on the Great Lakes. In his work, Captain Evers has been aided by T. W. Richards and Lewis S. Howard, naval constructor and assistant constructor,

who have been in direct contact with the work.

They have also had supervision of the transformation of four lake passenger boats into transports, the SOUTH HAVEN, PURITAN, ROOSEVELT and VIRGINIA, now the BLUE RIDGE. The SOUTH HAVEN is about to go to the Atlantic

to take up her new salt water work.

In her rebirth, the WILMETTE will make good and redeem all the past, with many years of usefulness in training prairie boys to the ways of the sea. If war comes again, she will perhaps have an opportunity to plow salt water and uphold the Stars and Stripes.

Business Men Back Merchant Marine

"We recommend that the construction of a great merchant marine be continued and amplified, and that its operation under American control be kept safe by such legislation as may be necessary to insure its stability and its lasting value to American industries."

IN this manner the reconstruction convention held in Atlantic City, Dec. 3-6, 1918, went on record. The convention, attended by nearly 5000 business men, was held under the auspices of the chamber of commerce of the United States and was the greatest representation of business men that was ever brought together in America. While their action on the merchant marine problem was constructive in intent, it left to the government the problem of working out the details.

Charles M. Schwab, who had just resigned as director general of the Emergency Fleet corporation, touched a responsive chord when in his address to the convention, he said:

"A great merchant marine for the United States is essential for its ultimate success, and its successful operation is not for the benefit of any one man or class of men or any one branch of business, but is for the good of every individual citizen of the United States. I do not care whether he be farmer, lumberman, manufacturer, or merchant, a great merchant marine is essential for every man in the United States. I do not care what plan, in the opinion of our great legislators at Washington, may be best for the operation of these ships so long as they are operated economically and so long as the expense of operation is not borne by

any one or few, but by the whole people.

"No American shipping can be profitable or successful or enlist private capital today, as shipping is now operated, and the great chambers of commerce of the United States and you, the people who constitute these chambers of commerce, and you, the manufacturers of the United States, must raise your voices for the successful operation of our mercantile marine. Do not let the cry that a few may profit by subsidies or otherwise deter you in the least. I do not care in what form the people pay the bill. If the government operates the ships themselves and it operates them at a loss the people pay the bill. If the ships are operated by private concerns and a loss accrues that is made up in some form of subsidy, the people themselves pay the bill. So that whatever form may be adopted we must find the means of doing it."

Government Realizes Need

That the American merchant marine is needed is realized by the government, was set forth by Secretary of Commerce Redfield. "Soberly looking at it," said Mr. Redfield, "I think that every ship the world has and can get has all of its carrying capacities taken for the next two years to come. Many of our ships will be used for our growing and developing trade with South America, because a number of our vessels are of a type which it is not economical to send abroad. We should, therefore, have no fear on that score."

Edward A. Filene, Boston, declared that the need for ships promises to

bring out an over-production and that therefore this is a time to ask for an international agreement among maritime nations. He said:

"To us here in the United States ships mean business, mean profit; to Britain, ships mean life. Britain has at any time not over a few months' food on hand, and only a limited part of the raw materials on which her industrial and business life depend originates in the British Isles.

"If our ocean transportation were cut off we should lose business and money; if Britain's ocean transportation were cut off she might perish. We in the United States can afford to take some chances. As to ships, Britain cannot. I am asking you, as I am asking myself, to vividly picture Britain's exact position, because that position and what it properly implies is the keynote of the international problem of the mercantile marine, and will force on us a long and mutually harmful struggle if we do not with business-like vision and sympathetic understanding avert it by proper international co-operation."

The schooner A. M. BAXTER, owned by the Offshore Shipping Co., Seattle, was recently wrecked on a coral reef at Valtuleile island in the south seas. The BAXTER left San Francisco on May 28 with a cargo of case oil for the Fijis and was on her return voyage with a consignment of 800 tons of copra when she piled up on the reef. The vessel and cargo was valued at \$200,000 and is a total loss. Capt. A. E. Hellquist and his crew of eight men covered the distance to Suva, 75 miles, in an open boat where they reported the loss of the vessel.

Discuss Future of Merchant Marine

Naval Architects and Marine Engineers at Annual Meeting Consider Effects of Recent Developments in Concrete, Welded and Fabricated Ship Construction

RAPID developments in the science of shipbuilding under pressure of war and their relation to peacetime conditions were emphasized at the twenty-sixth annual convention of the Society of Naval Architects and Marine Engineers held in Philadelphia, on Thursday and Friday, Nov. 14 and 15. Particularly interesting were the reports on the status of the fabricated and concrete ships and the progress in electric welding as applied to shipbuilding, achievements along these lines standing out as the three major developments of the past year. The timeliness of the meeting and the excellent program afforded attracted the largest gathering of members in the history of the society.

The professional sessions were opened on Thursday morning by the presentation of a paper, "The Delamater Iron Works—the Cradle of the Modern Navy," by H. F. J. Porter. Mr. Porter sketched the development of this famous works from its origin in the late thirties of the last century until it closed down in 1890, simultaneously with the death of Mr. Delamater. It was in these shops that the boiler and engine equipment was designed for many of the historic American vessels of the eighteenth century. Mr. Porter, in his paper, depicted the early struggles of Capt. John Ericsson, famous as the designer of the *Monitor*, and whose fortunes were closely allied with those of the De Lamater Iron Works from its early beginning.

Wooden Ship Progress

A paper on wooden ships was prepared by Carlos De Zafra. "Today's problems," Mr. De Zafra stated, "have introduced some new methods of construction. On the Pacific coast long timber is available, keel sticks being from 80 to 100 feet and in a few instances, I am told, as long as 150 feet between scarphs, while on the Atlantic coast a 50-foot stick would be considered a good specimen. On both coasts, however, steel has been introduced for keelsons and for brackets or braces to supplant the ever decreasing supply of ships' knees." Continuing, he said that the use of compressed air has solved to a great degree the difficulties arising from the old hand and brush method of painting, and pointed to the numerous improvements in building equipment.

W. T. Donnelly described the method followed in applying buoyancy boxes to the steamer *Lucia*.

The progress in turbine ship propulsion was set forth comprehensively in a paper by Francis Hodgkinson. He stated that while progress over the past 30 or more years had been rapid, accruing in many advantages, there had been but few installations in this country until the completion of the shipbuilding industry had been completely changed by the war. He stated that there still is much apprehension over the reliability of such installations, but added

that if current rumor may be relied upon there have been many failures, which with more careful design or by employing the best in the art, would seem to have been wholly unnecessary. He presented a list of all vessels equipped with the floating frame gear and Westinghouse turbines, giving the dates on which the vessels entered service, the power of the installations and the approximate number of miles traveled, which threw an entirely different light with respect to the success of current installations. Mr. Hodgkinson said he believed the marine engineer might look with advantage upon the best practice of engineers in charge of the larger power plants throughout the country, where the problem is one almost solely of producing reliable energy for the least cost.

Launching Problems

The great pressure for ship production in the past year has focused particular attention upon the relative merits of side launching and end launching. A discussion of this question was led by Professor H. C. Sadler, who read a paper, "Side Launching of Ships on the Great Lakes," prepared by Edward Hopkins. In the course of his remarks, Mr. Sadler said that the preparation of the ground for building ships that are to be side launched is much the same as for ships built for end launching, with the exception that the ship is on an even keel when building. This, he added, is considered by lake builders as a great advantage, not only for general accessibility and the saving of scaffolding, and blocking, but everything is plumb from the keel, which being level, no rake has to be considered. The paper points out that "as most of the ships are built on permanent berths, and as these berths run from 80 to 100 feet in width, this, with the inclination of the ways, usually from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches to the foot, assures a height of keel blocking from 4 to 5 feet, which gives good working room under the ship's bottom. There are no extensive launching calculations required for side launching. The method is particularly adapted for repair yards where the graving drydocks are used for launching slips. The methods and arrangements used by the Toledo Shipbuilding Co. were taken as being illustrative for all practical purposes of those employed in other lake yards. In the discussion following, the advantages of the deep water along the ways as exists in the yards where the ships are side launched were strongly emphasized.

Another enlightening paper on launching methods was prepared by William Gatewood, the title being "Notes on Launching". He pointed out that in launching large and heavy vessels, the pivoting pressure and the minimum moment against tipping are two conditions of operations which

usually receive special attention. The use of crushing strips in the fore poppets, Mr. Gatewood declared, seems the most simple and the most effective method of distributing the pivoting pressure. He added that the calculations to determine the number, size and spacing of the crushing strips are not elaborate. The minimum moment against tipping, Mr. Gatewood asserted, is primarily the measure of safety against the lifting of the fore poppets from the ways and the bodily tipping of the vessel backward as the center of gravity of the vessel passes the end of the ground-ways. The "tipping" of a vessel not infrequently occurred because the ways have not been extended a suitable distance under water.

Under the title, "Structural Steel Standardized Cargo Vessels," an interesting paper was prepared by Henry R. Sutphen, on the development of what is commonly referred to as the fabricated ship. After referring briefly to the conditions arising from the war which necessitated the production of ships in large quantities, he outlined clearly the manner in which this task was undertaken and the many problems which had to be solved. He spoke with particular regard to the progress made at the Newark Bay, N. J., yard of the Submarine Boat Corp., which company by the fall of 1916 had built on the fabricated ship plan 550 submarine chasers for the British government, a task which proved to be the "model experiment" for the far greater work of producing 150 steel cargo vessels of 5000 tons deadweight capacity for the government.

Developing Fabricated Ship

In referring to one of these 5000-ton vessels recently delivered, Mr. Sutphen stated that about 96 per cent of the total weight of the hull was fabricated at outlying establishments. Twenty-eight steel mills supplied material to 56 fabricating plants, not to mention the contributive labors of 200 foundries, machine, pipe, joiner and equipment shops which figure more or less in the building of a cargo carrier. The total weight of structural steel required was 1564 tons, 462 tons being in shapes and 1102 tons in plates. The only ship sections used in the design were a few bulb angles at both ends, amounting to $1\frac{1}{2}$ per cent of the total weight, or 23 tons. In concluding his paper, Mr. Sutphen stated that the work accomplished thus far has proved the soundness of the fabricated construction.

A comprehensive paper, "Vibrations of Beams of Variable Cross Section," was presented by N. W. Akimoff. Mr. Akimoff dedicated his remarks to the twofold object of presenting a succinct review of the fundamental results of the investigations of the best-known problems of vibratory motion of rods, and to reviving the

interest of research engineers in Ritz's remarkable method, published some 9 or 10 years ago, but comparatively unknown in many engineering circles, especially in this country.

"Experiments on Simplified Ship Forms," by Professor H. C. Sadler and T. Yamamoto, and "Variations of Shaft Horsepower, Propeller Revolutions, and Propulsive Coefficient with Longitudinal Position of the Parallel Middle Body in a Single-Screw Cargo Ship," by Naval Constructor William McEntee, U. S. N., were presented, both papers being published in full in THE MARINE REVIEW, December, 1917, issue.

Naval Constructor S. M. Henry, U. S. N., discussed "Recent Developments in Shipyard Plants." He pointed out the rapid progress which had been brought about by the great revival of shipbuilding. Methods have been improved and a continued demand is certain to bring each plant to a higher stage of efficiency.

About the Concrete Ship

A paper on the present status of the concrete ship was presented by R. J. Wig. He spoke with particular reference to the concrete ship of 3000 tons or over, such as is being developed almost entirely in the United States. "The use of concrete for ship construction," he said, "has been suggested by the structural engineer and not by the naval architect. Like all innovations, its development has been observed with much skepticism." Mr. Wig pointed to the handicaps under which the structural engineer has labored in not knowing the premises of ship design, and to the difficulty he had during the busy days of the past two years in gaining the assistance of naval architects. The concrete ship, he said, is truly a product of necessity, and is essentially a steel ship in which the proper quantities of steel are located where strength is necessary and concrete is used as an envelope and cementing medium with certain contributing strength.

In summing up briefly the present status of the concrete ship, Mr. Wig said in part: "All analytical investigations so far made demonstrate that the concrete ship can be designed so as to carry all the strains which come upon a ship just as safely as a steel ship. (2) The tare weight of a concrete hull has been reduced to such an extent by the development of a light weight aggregate that it has a proportionate carrying efficiency greater than wood ships and only slightly less than steel ships. (3) All available experience so far does not demonstrate any structural weakness which might indicate unsoundness in the theory of design of concrete or probable limited life. (4) There is no perceptible difference in the frictional resistance offered by a concrete ship as compared with a steel ship. (5) Our general knowledge of reinforced concrete as compared with steel structures makes the success of its further adoption for ship construction appear a certainty, but actual experience is lacking and therefore its future cannot be predicted with absolute certainty."

Of great interest was the paper,

"The Application of Electric Welding to Ship Construction," by H. Jasper Cox, who had participated in the pioneer work undertaken by the electric welding committee. In his paper, he reviewed briefly the work already done and the immediate possibilities of its further application to ship construction. So far, he asserted, results both in this country and in England have not only been encouraging, but have led to the conclusion that under certain prescribed conditions an electrically welded joint may with reasonable safety be applied to the main structure of a vessel. A large percentage of failures in electric welding, he pointed out, have been due to vain endeavors to apply the process in defiance of natural

in all respects as compared with the parent material united. It is comparatively easy to obtain an equivalent tensile strength, but tension is only one of many stresses.

"Another unknown factor which must not be lost sight of is the ability of a riveted ship to adjust itself to stresses. The joints are made up when the ship is on the way, inanimate. When she gets afloat an entirely different set of conditions are presented, and the unbalanced internal stresses introduced during the process of bolting up and riveting are frequently intensified. However, when put into a seaway, the repeated and alternating stresses cause her to 'work,' a rivet 'gives' a little here, a joint 'takes up' a little there, and the stresses are passed from one to another, until the structure acts as one harmonious whole. Just how essential is this property in a ship joint, experience with the first welded ocean-going ship alone can show."

The remarkable achievement at Hog island was vividly set forth in a paper by W. H. Blood Jr., of the American International Ship Building Corp. He sketched the progress of the yard from its beginning, back in September, 1917, to its present huge size. Mr. Blood predicted that despite the many difficulties which had to be overcome, and despite the many drawbacks encountered early in the brief history of Hog island, its contract with the government for 180 vessels will be completed before August, 1919, the date specified.

The annual report of Daniel H. Cox, secretary-treasurer, showed that the membership of the society on Nov. 1 was 967, there being 13 deaths and eight resignations during the year. Mr. Cox stated that there were approximately 500 applications. Disbursements during the year aggregated \$16,704.07, leaving a cash balance of \$4,953.47. The total resources aggregated \$38,714.59. The society's present worth, as of Oct. 31, 1918, was \$35,714.59; its total liabilities \$3,547.21.

Late Marine Patents

Copies of any one of these patents can be obtained by sending 15 cents in stamps to Siggers & Siggers, National Union building, Washington, by mentioning THE MARINE REVIEW.

1279548—Marine masonry construction, Henry Arthur Icke, Victoria, B. C.

1279947—Torpedo guard, Carl Vender, Holter, Mont.

1280217—Lifeboat, Edward A. Harvey, Cheboygan, Mich.

1280246—Ship protector, Andrzej Kubezko, Chicago.

1280406—Ship's navigating apparatus, Edward W. Couchos, Mackinac Island, Mich.

1280525—Torpedo protective device for vessels, Rudolph Nittner, New York.

1280526—Submarine mine, Thomas Keppel North, Westminster, London, Eng.

1280497—Releasing gear for lifeboats, Charles S. Lenz, New York.

1280483—Ship's life or emergency boat, Samuel Mathew Johnson, Cardiff, Wales.

1276042—Wooden tank vessel, William A. Ehsen, Montclair, N. J. Assignor, by mesne assignments, to the National Oil Co., a corporation of Delaware.

1276055—Life saving device, Wilfred S. Grolleau, La Salle, Ill.

1276327—Submarine tower barge for raising sunken vessels, Newton F. Chamberlain, Libertyville, Ill.

New Officers

Elected at the Annual Meeting, Nov. 14, 1918.

President

for three years, beginning Jan. 1, 1919

Rear Admiral W. L. Capps, U. S. N.

Honorary Vice Presidents

D. W. Taylor
W. M. McFarland

Vice Presidents

J. W. Powell
H. I. Cone
Lewis Nixon
C. H. Peabody
H. D. Goulder
W. J. Baxter
H. K. Magoun
C. P. Wetherbee

Members of Council

W. D. Forbes
Spencer Miller
C. F. Bailey
Robert Haig

Associate Members of Council

E. M. Bull
C. M. Wales

Executive Committee

Stevenson Taylor
Andrew Fletcher
W. M. McFarland
F. L. DuBosque
J. W. Powell

Committee on Papers

W. M. McFarland
F. L. DuBosque
H. L. Aldrich

Secretary-Treasurer

Daniel H. Cox

laws. "Good welds have been made for years," Mr. Cox stated, "but in the haphazard application of the art, worthless work has sometimes been turned out for which no other explanation can be offered than the welder's ignorance of the physics of his art."

In this country, so far, the practical application of electric welding to the shipbuilding industry has been confined to work of a nonstructural character, such as has been specified by the classifications societies.

Relative to the welded ship, Mr. Cox said in part: "Two significant points to bear in mind in designing an electrically welded ship, for the present at any rate, are, first, that we do not know all there is to know about welded joints, and, second, a welded joint has not as yet been produced which is 100 per cent efficient

Must Retain U. S. Merchant Marine

Opportunity for American Independence on the High Seas as Presented by War Emergency, Should be Realized—Optimism is Needed

By Lieut. Commander Stevenson Taylor, U. S. N. R.

THE entire merchant tonnage of the world in 1916 did not exceed 50,000,000 gross tons. Of this there has certainly been destroyed by submarines and casualties not less than 14,000,000 gross tons, leaving of the original quantity not over 36,000,000 gross tons. During 1917 and 1918 there was built at most 5,000,000 gross tons, making a total of available tonnage only 41,000,000 gross tons. Following the normal increase per annum there should be available at the beginning of 1919 at least 55,000,000 gross tons. From this statement it appears that there will be at the close of the year 1918, a deficit of at least 14,000,000 gross tons, without taking note of the depreciation and repairs which the excessive hard usage of ships during the war will have made necessary.

It is not intended that these figures shall be considered exact, but they are sufficiently so to demonstrate the great necessity still existing for ships; and further to show that our own shipyards must still be urged to their utmost capacity in order that the now important American merchant marine shall be upheld in the future.

In the year ended June 30, 1908, the entire production of our shipyards was 614,000 gross tons, the greatest previous to 1915; but in the year ended June 30, 1915, the production fell to 225,000 gross tons, the smallest output in 17 years. In 1916, there came an enormous demand for ships not only from our own citizens but from foreigners as well.

When the United States entered the war in April, 1917, it became apparent that there was hardly a more important element for winning the war than ships, and the United States government, through the agencies of its shipping board and Emergency Fleet corporation, immediately proceeded to encourage the building of many new yards as well as the enlarging of the old yards with the result that there are now about 200 shipyards, instead of 66 as in November, 1916. During 1917 there was an output of 800,000 gross tons and the output for 1918 will apparently be about 2,500,000 gross tons actually delivered and officially numbered. The increase in our registered shipping during the fiscal year ended June 30, 1918, was 1,053,481 gross tons, more than double that of any previous year and something over the total increases for the first three years of the war combined. At the end of this year there will be over 10,000,000 gross tons of shipping under the American flag, or nearly double the amount of three years ago.

The demands upon our facilities for furnishing the usual materials for

ships and the lack of men capable of building ships in the usual manner combined with the extraordinary need of ships, and more ships, to carry on the war, has led to experimentation in building large vessels of other than the usual wood and steel materials.

The successful use abroad of moderate sized boats built of concrete reinforced with steel has led us to go much further resulting in the building of the *FAITH*, a concrete ship of about 3000-gross tons and the placing by the Emergency Fleet corporation of contracts for 42 concrete ships totaling about 200,000 gross tons.

The details, advantages and disadvantages of building reinforced concrete ships have received a great deal of attention from the officials of the Emergency Fleet corporation and it is fair to presume that their investigation has warranted the contracting for four ships of this class of about 2500 gross tons and 38 ships of about 5000 gross tons each.

This same question has been also under examination and discussion in Great Britain and naturally personal designs and views differ materially. Having had no experience in concrete construction and noting the different proportions of steel in several designs and acknowledged contrasts in carrying capacity and speed with like power, I feel that the concrete sea-going ship is still an experiment and that it is quite possible that the emergency which promotes the building of these ships will have vanished before those contracted for will have performed much service.

Electric Welding of Ships

Another novelty is the proposed electrically welded ship which has now been under consideration for several months. There has been a vessel manufactured on this plan in Great Britain, but it is so small that nothing is proved so far as the building of ocean-going ships is concerned. Electric welding certainly has proved successful in many places and under peculiar conditions so that the proposed construction of a full size section of a large cargo steamer for complete tests of the method is both interesting and satisfactory.

Records of various processes have from time to time been noted. The number of frames erected in a day; the number of rivets driven; the few days that have elapsed between the laying of the keel and the launching and again between the launching and the trial trip; the lineal amount of caulking both on wood and steel ships and so on to absurdity. We venture to say that in every instance of these special records there has been special preparation that the records shall be made. The fact remains that the general results attained in the long

run are not in accordance with records and it were better to remember that 400 rivets for every gross ton for a day's work is a more satisfactory performance than an occasional 1000 or more rivets.

It is, however, to be said in justice, that the performance of fitting a ship in an unusually short time and the performance repeated over and over as has been done, is worthy of the highest commendation.

I have said nothing about the navy for it is evident from the statements published from time to time that the interests and upbuilding of the navy have not only been well taken care of in the recent years of the war, but that they will also be well advanced in the future.

It is to the American merchant marine that we must particularly tend. The shipyards in which naval vessels have in the past been built will also build what will be required for the navy of the future. They will as well produce their proportion of merchant vessels and in addition we now have all of the shipyards.

Our shipyards have produced during the year a greater tonnage of merchant vessels than was ever heretofore in any one year produced in the yards of the greatest shipbuilding nation in the world.

The United States has spent contracted to spend enormous funds primarily to help put down the war and incidentally to place upon the seas a great tonnage under our flag.

Now that the inevitable end of a great war has come, the problem following the destruction and disorganization caused by the war demands the attention of our best ability and judgment. I pass all of the problems not in themselves specially pertaining to this society. The one great problem for us to consider is that of the future of our merchant marine and what is to be done for it.

You who are owners of ships and shipyards, and you who design and construct ships cannot be indifferent to this question. There are at present in service, as has been stated, 10,000,000 gross tons of American merchant ships, double the amount three years ago, and there is a capacity in our yards for building in addition to the ships for the navy, at least 3,000,000 gross tons per annum. Some of these yards, of course, build wood ships which will be useful coastwise if not across the seas.

When the war is really over shall we as a nation supinely as in the past permit the other nations of the world to carry our entire commerce overseas?

It is incredible that any administration of the United States government shall thus sacrifice the great future and efforts, individual and collective that have been expended in the past

Abstracted from the presidential address given at the annual meeting of the Society of Naval Architects and Marine Engineers, held in Philadelphia, Nov. 14-15.

two years to build up facilities, to educate men, and women too, in order that we may have and operate ships of our own; and if there are laws upon our statute books that prevent our reasonable operation of ships, they must be amended; if our loading, unloading and other port facilities are not what they should be, they must be changed; if there is anything which interferes with our progress upon the seas, it must be removed, and if there is anything yet lacking to advance this progress, even government ownership, or private ownership aided by a judicious government, it must be developed not for the advantage of any section or coast, but for the needs and advantage of our whole nation.

I am quite aware that these are most general statements and that I have suggested no special plan for bringing about that which is so much to be desired. Frankly, I must say that the questions involved are too much for one man and the result desired

can only be accomplished by proper co-ordination of those out of whose experience may be determined the best course to follow.

I recall at this point the wild statements made early in 1917 as to our promised ship production. No one familiar with our business was deceived; but when the summer of that year had passed, and numerous yards had been established and the great number of fabricated ships had been contracted for, our hopes were raised that there would be during this year 1918 a production of ships in our yards considerably greater than ever before produced in one year in any other single nation. We have not realized these fond hopes, but building the yards and 2,500,000 gross tons of ships in 12 months while all of the great war program was also being carried on, is an accomplishment worthy of notice and praise.

We must look to the future with optimism. In a Washington office hangs a placard which says: "It can't

be done! *but here it is.*" We must neither think or say it can't be done.

No citizens of this great land are more interested in producing a merchant marine than yourselves. We naturally belong to the coasts and the Great Lakes. We must be optimistic that we may exert our own great ability to its utmost. We must carry our optimism to our inland citizens lest they forget the lesson of how much they needed ships in the years 1914 and 1915. We must be Americans and think in American terms.

Paraphrasing a quotation used at our banquet a year ago I repeat, "We have performed gigantic tasks more rapidly in all the circumstances than could any other nation in the world. We shall build ships; we shall secure and train officers and sailors," and we shall establish and keep forever a merchant marine on the seas of the world, "for the sea was in our father's blood, the ocean is our birthright." This also gigantic task we shall perform.

Concrete Ship Faith Weathers Trials

SHE behaved like a duck," asserted the stalwart engineer of the concrete merchant ship **FAITH**. He was speaking with enthusiasm of the ease with which the long voyage from Chile to New York was made, and the small amount of oil he had burned. "We ran into some severe storms coming up here but not once was it necessary to use the pumps down here. Of course it was rather wet on deck." He spoke with the careful diction of the new type of merchant seaman and the crowd of New York shipping magnates who had gone below to the engineroom listened with respect.

This new giant concrete freighter has been in continuous service for six months. After discharging her cargo at New York she went into drydock for a survey. She was still in perfect order. There was no scraping to be done because she was made of concrete but the owners gave her a coat of paint. Two days later several little puffing tugs nosed her around to pier

42 where a miscellaneous cargo for Chile was taken aboard. It was at this time that the New York visitors boarded her. They went through the forecabin, down into the holds and through the engineroom. The vessel was in perfect order and not a trace of wear or tear could be found.

Predicts Bright Future

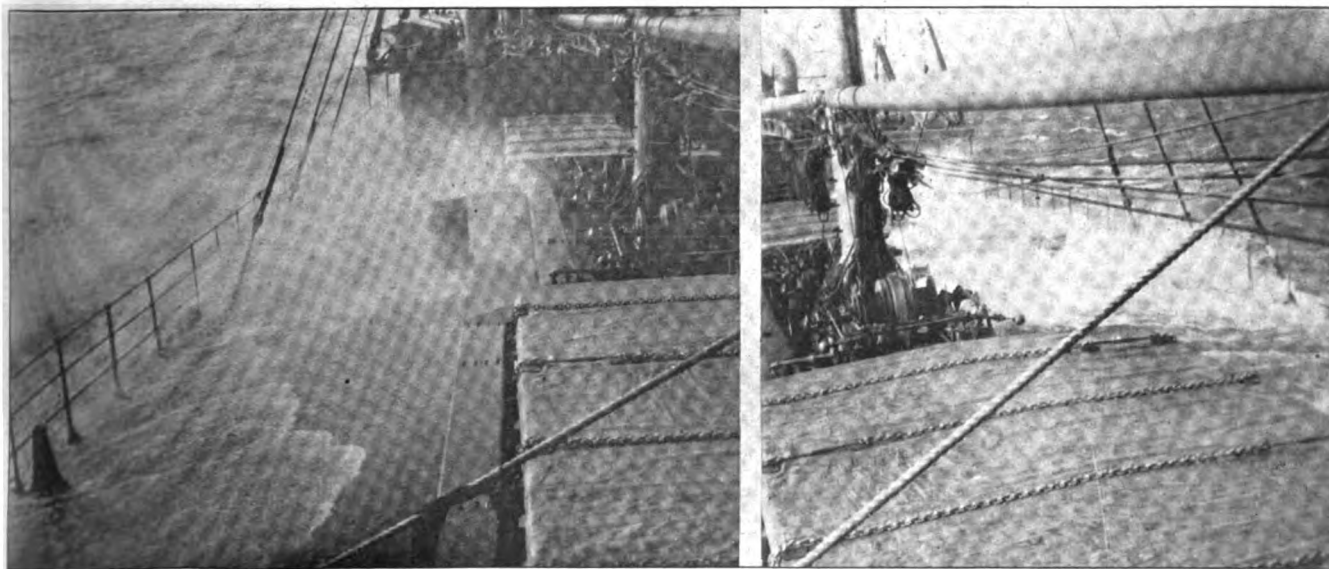
"She may not be good to look at," commented one of her officers, "but she certainly does deliver the goods. Twenty years from now we shall be building passenger liners of cement."

Weakness developed in the deck of the ship after her trials. It was discovered that the thickness of the cement deck was not sufficient to support the windlasses and other deck machinery and it began to crack. It was therefore covered with a mixture of asphaltum and no further trouble has been experienced. The **FAITH** is 336 feet over all, 45 feet beam, and 31 feet molded depth to upper deck. Her sides

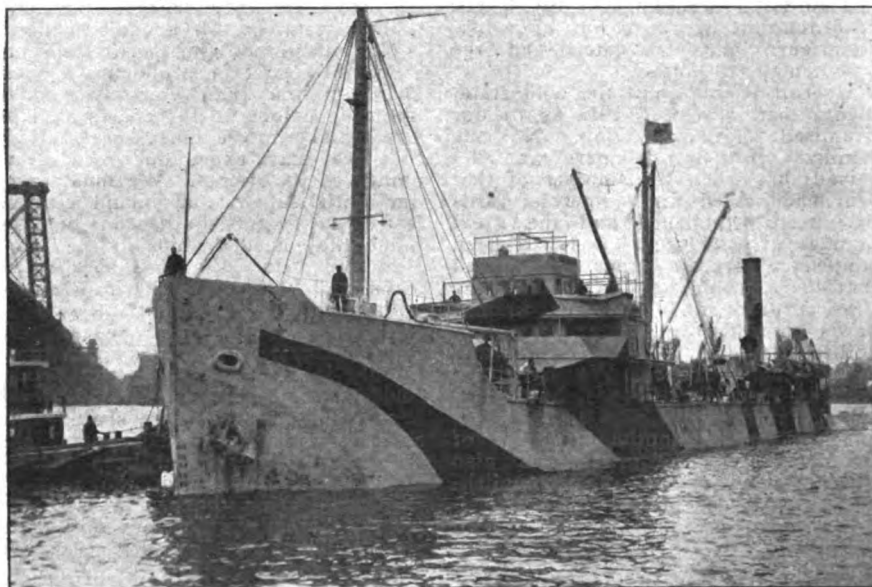
and bottom are approximately 4 inches thick. Her draft loaded is 21 feet 10 inches forward and 23 feet aft. But for the superstructure in the rear where the crew is accommodated she would present a peculiar appearance on the water. At that, the unusual height of the prow is marked. The vessel has Scotch marine boilers and 1750-horsepower triple-expansion engines.

She lays low in the water and refuses to ride the waves like an ordinary steel ship. Instead she plows her way through heavy seas. No great disadvantage has been discovered from this fact inasmuch as her cargoes have been carried dry.

The vessel was launched at Redwood City, Cal., on March 4, 1918. She left San Francisco on May 22 with a cargo of salt and copper ore bound for Seattle, Tacoma, Wash., and Vancouver, B. C. On this maiden voyage she encountered heavy weather. The maximum roll was nearly 13 degrees, and the wind blew in excess of 65 miles an hour. Despite



IN ROUGH WEATHER THE FAITH REFUSES TO RIDE THE SEAS—SHE PLOWS THROUGH THEM—HER CARGO, HOWEVER, REMAINS DRY



CONCRETE SHIP FAITH AS SHE APPEARED IN NEW YORK HARBOR—THE VESSEL'S BOW IS OF UNUSUAL DESIGN

this difficulty the ship arrived at Seattle on Tuesday, May 30, and Tacoma the same day. Leaving Tacoma June 1 she arrived at Vancouver on June 7, there discharging her cargo. The FAITH was so constructed as to have an estimated speed of nine knots. On her trip to Vancouver she made 11 knots. The vibration was said to have been at a minimum.

At Vancouver the ship took aboard a cargo of lumber for Chile. This discharged she proceeded north again with a cargo of nitrates by way of the Panama canal to New Orleans. A mixed cargo was carried from New Orleans to Havana. She left Cuba with a cargo consisting of 20,000 bags of sugar and had the honor of landing one of the first sugar cargoes of the season at New York on Nov. 14. The cargo was discharged, the vessel put into dry dock and painted, and on Nov. 27 she was docked at her pier ready to receive her next cargo.

Promoters of the concrete ship program insist that the experience with the FAITH has demonstrated the practicability of this type of ship. The ATLANTIS, the first concrete ship launched for the government, slipped off the ways at the Emergency Fleet corporation's yard, operated by the Liberty Shipbuilding Co., at Brunswick, Ga., in November. This vessel is 3000 tons deadweight and is the first of a series to be built for the government. At Wilmington, N. C., a 7500-ton ship and two 3500-ton ships are in course of construction in government yards. The navy is planning to order several 500-ton coal lighters, and the embarkation service has in mind a program calling for a number of barges, lighters and tugs of concrete.

Foreign builders also have been quick to realize the possibilities of concrete ships. It is said that about 200 vessels are being built in England of this material, representing an outlay of approximately £4,000,000. Reports from Spain indicate that a concrete ship of 6000 tons built there has made a successful trial trip.

After nearly three weeks of vacillation during which the vessels were com-

mandeered three times and released by the shipping board, the government finally took over the operation of the Pacific mail steamers SANTA CRUZ and VENEZUELA. Final orders were received at the offices of the company in San Francisco about the middle of November. The cargoes were discharged and the ships ordered to Puget sound.

Seeks More Trade for Philadelphia

George S. Webster, director of the department of wharves, docks and ferries, Philadelphia, recently drew attention to advantages of the port as a shipping center and pointed out that the port is not being used to more than 50 per cent of its capacity. A committee of citizens, which was organized to secure more business for the port, shows that while the volume

of trade in Philadelphia was, next to New York, the heaviest in the United States, more foreign and domestic traffic could be readily handled.

This committee, with Mr. Webster as chairman, appealed to the federal authorities for greater allocation of the port of Philadelphia of both road car facilities and ship tonnage.

G. H. Markham, regional director of railroads, declared that the port of Philadelphia was not handicapped by a lack of cars, nor by congestion on the railroads, but by a scarcity of ship bottoms. The federal authorities have ruled to place an embargo on the shipment by land and water of freight from Philadelphia to New York for transportation from that city to ports in the South and Southwest. This ruling should make Philadelphia instead of New York the port of sailing for steamers plying between southern ports.

Director Webster announces that his department will, in the spring of 1918, proceed to carry out the municipal policy of increasing the facilities of the port by building additional piers and warehouses. These are to be located near two government piers. The warehouses now in course of construction.

The end of the war gives Philadelphia an opportunity to proceed with the work of extending its facilities and much discussion is being heard in the Quaker City regarding the future of the Hog Island shipyard. It has been urged that the city of Philadelphia acquire this yard for an immense shipping terminal as the site for a free port.

Another activity of Director Webster's committee of citizens was directed toward securing drydocking facilities for the port. The government recommended to the shipping board the building of three docks and the body is said to favor the project.

Philadelphia has been selected by the Belgian Relief society as the port for shipment of supplies overseas. A number of Swedish and Dutch vessels have loaded cargoes of wheat, flour and other foodstuffs there, consigned to Belgium.



DECK VIEW OF THE FAITH—LARGE HATCHES SERVED BY STEAM WINCHES HANDLE CARGO QUICKLY

English Shipping Shows Its Scars

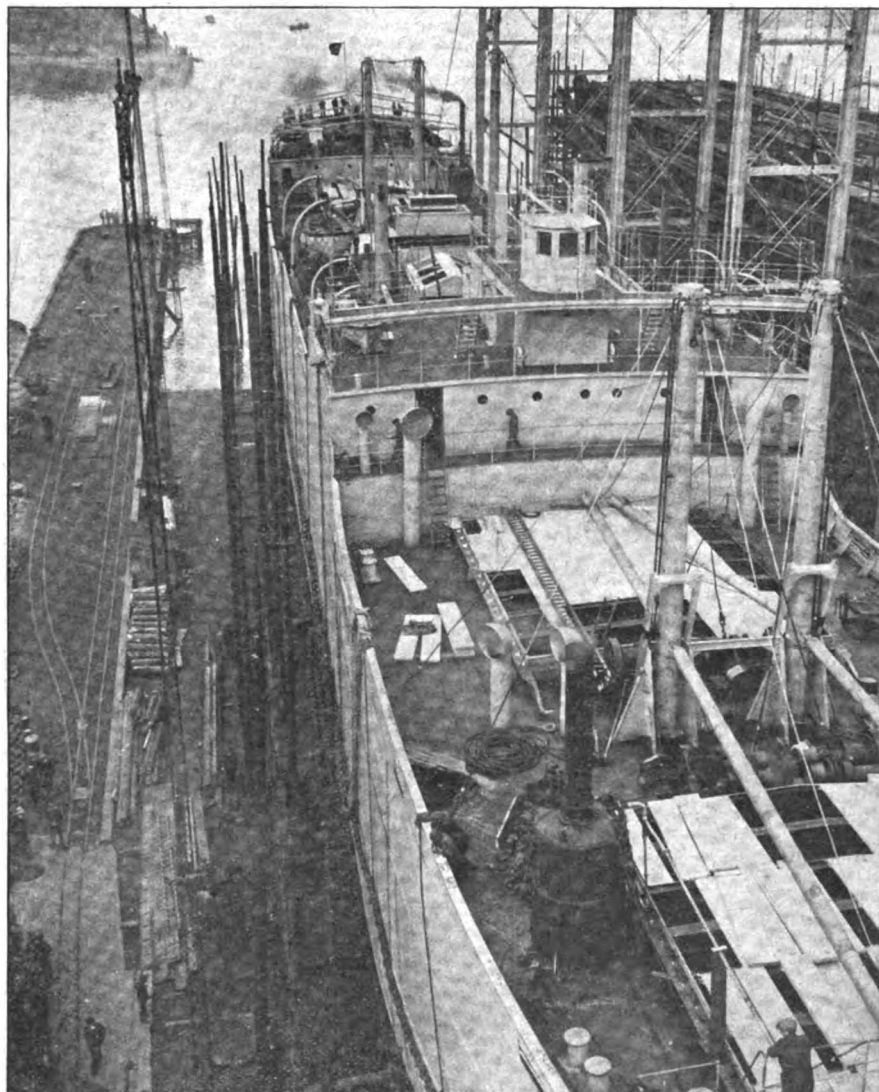
GERMAN propaganda has been making it difficult for the average American to appreciate England's reconstruction problem. The insidious lies spread so frequently have for their evident object the provocation of jealousy or distrust between the two peoples who have been fighting side by side to destroy both political and commercial autocracy. Great Britain has a serious problem to solve in connection with her merchant marine and of course it is to the interest of the Germans to have its solution confounded. Propaganda has been spread with this object in view. Only a short time after the signing of the armistice and the cessation of fighting, an article appeared in one of the more substantial American journals in which was delicately veiled a fear that England had ambitions on the high seas which may not be to the benefit of the United States.

The same thing has been seen in other disguises. On another occasion criticisms were published of an alleged attempt to pool all the merchant ships of the allies during the period of reconstruction. Officially there has been nothing said regarding a pooling of ships. When the United States went to war, some Washington officials made the proposal that all ships be pooled and as a result of that some form of pool was worked out, but England has held out resolutely against any pooling arrangement. Each allied nation has held on to its own ships and operated them. Tonnage was diverted, however, and sent to this or that port by direction of the central ship committee or pooling committee.

Widespread Propaganda

German propaganda has been discovered not only in the United States but also in England. While trying to frighten Americans into believing that England is ambitious to control all ocean shipping, the Germans have been trying to frighten the English with stories of the rapid strides made in the United States in building merchant ships. The English have a clear vision of the German intentions and one English journal spoke of the instance after this fashion:

"If Germany were in our place she would be green with envy of American prowess in shipbuilding. Here, then, to the German is a fruitful field ready tilled for the sowing of the seeds of division between Great Britain and the United States. He is doing his best to get them sown—with poor success—for the maneuver is childish in its sim-



First British standardized vessel ready for launching—The work of fitting out has been carried on while ship was still on the ways

plicity; both the American people and ourselves have known that it would be tried, and it has only to be denounced in public to be stripped of all its petty ingenuity."

Unless this German propaganda is understood, it would indeed be difficult for the American people to appreciate the British merchant marine problem. It is true that England has the largest merchant fleet of the world. She had it before the war and she retains her supremacy today. But her merchant marine has been stripped of the largest and the best ships, and the remainder have been badly used in war work. Her ships are still subject to strict government control and private initiative is restrained by import and export restrictions. The United States boasts of a merchant fleet which has multiplied in size by the war. England's merchant fleet has been diminished by the war.

A Declining Tonnage

Briefly, this is how one British authority outlines the situation:

"While the enemy has destroyed nearly 9,000,000 gross tons of British shipping, our construction of new vessels has amounted to less than half that figure, and still lags month by month behind our losses. In the four years

preceding the war the average output of British yards was 61 per cent of the total world construction; today it is little, if at all, over 30 per cent. Before the war we owned nearly half of the world's steam tonnage. We shall be fortunate if, when it ends, we own as much as a third."

British ships are badly in need of repairs. This fleet was used to bring the colonial troops to France, and these ships transported over 60 per cent of the American forces across the Atlantic, while maintaining supplies of food and munitions in Europe. Her ships have been pushed to the limits and repairs were foregone whenever possible. They have been withdrawn from the less essential trades and neutrals have, during the past four years, taken advantage of the opportunity, building vessels and engaging in commerce that England has been forced to neglect. The end of the war finds British shipping face to face with new and entrenched competition in her own markets, even in the markets of her own colonies. During the past four years foreigners have established some 25 new steamship services on routes once securely held by the British.

This is a situation which readily stirs the sense of justice of the men trained

in business. There is, moreover, a national viewpoint to the matter. England comes out of the war saddled with a tremendous debt, both domestic and foreign. Upon her ability to dispose of a surplus of her meager resources in goods and services depends England's ability to pay off this debt, and to resume her commercial and financial leadership. British economists are advising that the future rests upon increasing production and reducing consumption, upon having more and requiring less.

England's plans for the reconstruction of her merchant marine are predicated upon this economic basis. British ships must be used to restore British credit, and finally British commerce. Early in 1916 the president of the board of trade, which is an integral part of the British government, appointed several departmental committees to consider the probable position of various important branches of British industry after the war, "especially in relation to international competition, to report what measures, if any, are necessary in order to safeguard that position." These committees were for the coal trades, iron and steel trades, engineering trades, electrical trades, and nonferrous metal trades, shipping and shipbuilding industries and textile trades.

Commercial interests in England opposed the tendency toward government control. Individualism has been a traditional doctrine of the British business world. A report adopted by the London chamber of commerce in July, 1917, criticized the government for its meth-

ods in controlling the import trade during the war and for its failure to co-operate with business interests. The official organ of the London chamber pointed out on many occasions the necessity of warning the public and the government against the danger of "perpetrating after the war the methods of expediency which may have been justified during the war."

New Government Bodies

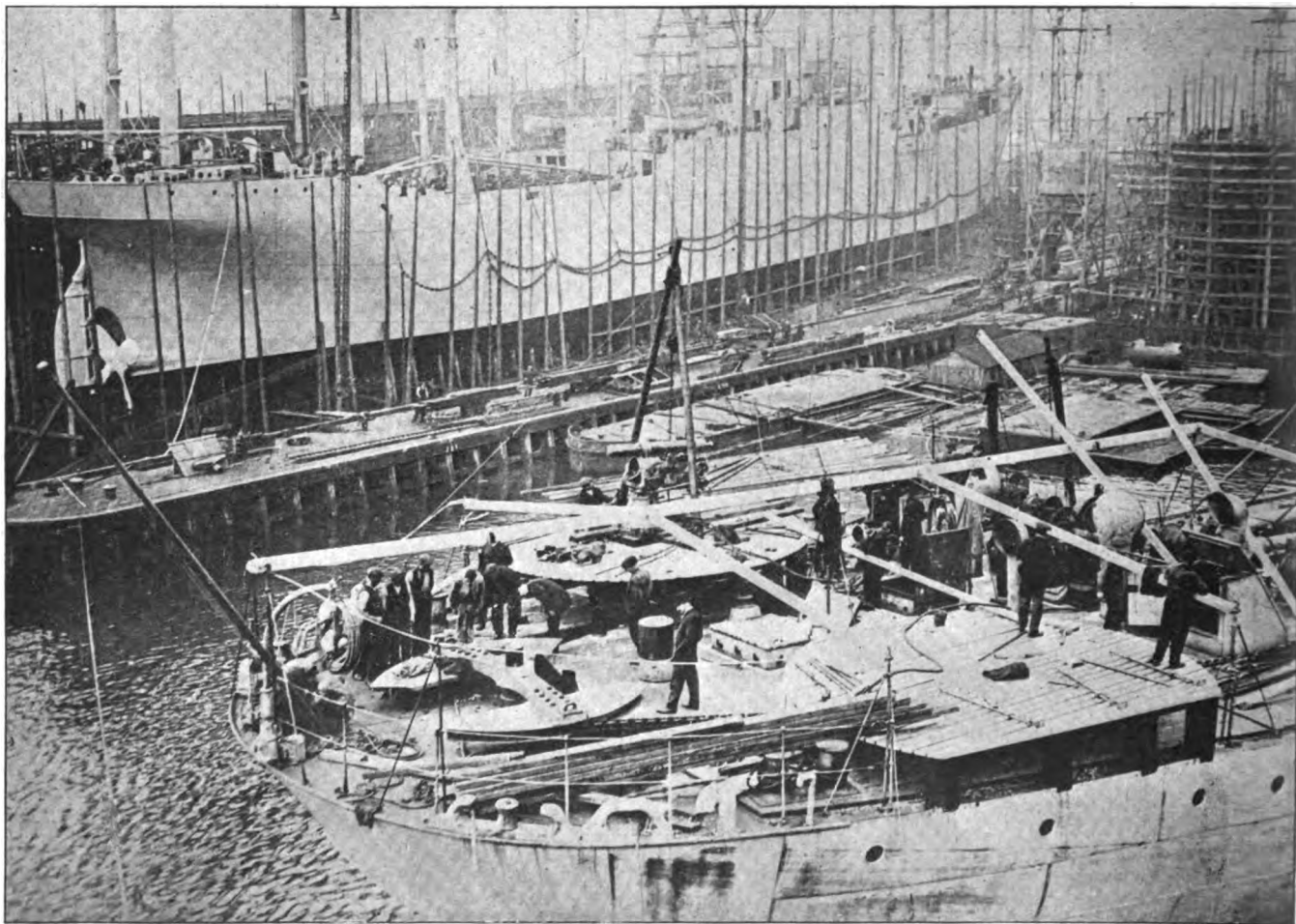
Were England to relinquish her control of the merchant ships today and return them to their private owners, it is doubtful whether they could be operated under prewar conditions. The government has built up a number of organizations which would have a far reaching effect upon any shipping, and furthermore there have been some important changes in financial institutions which will dictate new conditions and changed associations. The government has established the department of overseas trade (development and intelligence), which is a joint department of the board of trade and the foreign office. The new department is a substitute for a separate ministry of commerce, for which there has been a considerable agitation, especially on the part of the associated chambers of commerce of the United Kingdom. It has under its jurisdiction the trade commissioner service, the commercial attaché service, and for trade matters the consular service, although the consuls are still a part of the foreign office.

The new department has introduced some reforms in the consular service,

particularly as regards the compilation and distribution of consular reports, and is planning a considerable extension of the trade commissioner's service. The entire work of the board of trade has been divided into two main departments. The department of commerce and industry is to supply trade information, plan and work out national commercial and industrial policies, and otherwise promote trade, while the department of public services administration is engaged primarily in administrative functions of a more permanent nature with regard to trade and transportation, such as harbors, merchant marine, railways, companies, etc.

What is likely to be the permanent effect upon British shipping of these tendencies of the government can be foretold only by an Englishman. There has been noticeable, however, a trend toward combination, and a strengthening of the individualism of British business through co-operation. The British Trade Corp., which is an outgrowth of the report of the board of trade committee on financial facilities for trade, under the chairmanship of Lord Faringdon, received a royal charter on April 21, 1917, in spite of some pronounced parliamentary opposition. It has a capitalization of £10,000,000 and is intended to supply longer credit than is granted by British joint-stock banks and to assist British industry and trade in connection with new overseas undertakings and contracts in somewhat the same manner as the German banks.

England is evidently trying to make the very best of what the war has left



FITTING OUT A STANDARD SHIP IN A BRITISH YARD—IN THE BACKGROUND IS A SISTER SHIP READY TO TAKE THE WATER

© by British Pictorial Service

her. The fighting has drained her not only of her men but of her most precious resources. German submarine warfare was aimed primarily at British shipping and English liner tonnage today is her weakness. The Hun was very shrewd in his ambitions and crude in his atrocities. It is a peculiar commentary on the outcome that the largest merchant ship left in the world today is the BISMARCK. The largest British ship is the White Star liner OLYMPIC, built in 1911, of 46,359 gross tons. The Cunard's largest vessel is the AQUITANIA, of 45,647 gross tons, built in 1914. Then comes the MAURETANIA, built in 1907, of 30,704 gross tons. The largest vessels of the Peninsular & Oriental line are the NALDERA, built in 1918, of 15,092 gross tons, and the NARKUNDO, built in 1918, of 14,500 gross tons.

Her vast grayhounds of the deep, however, are gone and it will require years to replace them. The loss of this liner tonnage is a serious obstacle to England's reconstruction plans. There is also another side.

"Old ships can be reconstructed and new ones built," recently said an English authority, "but lost markets and a disrupted organization are handicaps more difficult to overcome. Before the war about a third of the seaborne commerce between foreign nations was carried in British ships. Most of these trades have had to be abandoned. In addition, we have cut to ribbons the commerce between the United Kingdom and the rest of the empire and of the world, have been forced to reduce sailings to India, Australasia and the Far East almost to vanishing point, have concentrated our tonnage on the short Atlantic routes, and have thus relinquished trade after trade in which formerly the Red Ensign predominated."

That expresses well the most ambitious plans of the British, and yet the German propagandists would have Americans believe that it is a forerunner of trouble. Germany has in the past adopted similar methods of gaining an advantage for herself. The shipping world remembers well how Germany began with a frontier system of health inspection which developed later into government shipping agencies. These agencies enabled the German companies to get the cream of the Atlantic emigrant traffic, to divide their competitors and to force unfavorable agreements upon them.

End of Pools

The war has ended all these pooling agreements, both as to freight and passenger traffic and it is doubtful whether the British will ever be trapped into others, at least not with ships of her erstwhile enemies. On the other hand the peace terms, involving as they most likely will a league of nations, will probably contain clauses which will insure a more liberal usage of merchant ships. There rests upon England the moral obligation not to use her merchant tonnage as a check upon the legitimate commerce of her allies and anyone acquainted with the fairness of the British knows full well that such an obligation will be observed.

It must not be forgotten, however, that British shipping is still being operated under government control. Individual initiative is yet lacking, and how long before private effort will once more be the predominating factor is merely a matter for speculation. International corporations or amalgamations



CAPT. J. MCKIE AND FIRST OFFICER J. ADAMS OF THE FIRST BRITISH STANDARD SHIP ABOUT TO PUT TO SEA

of private interests for the operation of ships are things of the past. Those that the war itself did not break down, individuals themselves are trying to break up. This tendency was shown only recently when there was an attempt by British capitalists to purchase the British ships from the International Mercantile Marine Corp. It was proposed to dispose of the 750,000 tons of ships owned by the British subsidiary of this company. These ships fly the British flag and include the large passenger vessels of the White Star line. Just as a basis of sale had been reached, the conclusion of the deal was interrupted by the United States government.

To Give Up Ship Control

British vessel owners who have been apprehensive over the plans of the government were reassured by A. Bonar Law recently in a speech to parliament. In answer to a question Mr. Bonar Law declared that the government has no intention of nationalizing shipping, but that the merchant vessels commandeered during the war would be returned to their owners just as soon as the emergency is past. How soon that will be is, of course, a matter of specu-

lation. Some British authorities are anticipating that the government control of shipping will continue for probably a year after the declaration of peace.

"We have not peace yet," it was remarked significantly by a British official, "only an armistice has been signed."

In the meantime the British continue their censorship, tighten their control, and take all precautions against enemy interference. The convoy system is continued and all possible safeguards are thrown around her ships.

Plans for the restoration of the British marine on the high seas are yet in the formative stage. No set policies have been determined upon. It is said to be the intention of the British to consult first with the leading representatives of her allies before drafting their own plans. It was for this reason that E. N. Hurley, chairman of the United States shipping board, was invited to London. He will be given the latest data in regard to British shipping, and in return he will outline to the British some of the plans of America. The reconstruction plans, when they are worked out, must be based upon a solid foundation.

Move to Standardize Ship Steel

Steelmakers and Government Officials Discuss Standard Lists Which Will Promote Production at Mills and Yards—British Practice Approved

WITH the object of securing standardization of ship steel, of modifying designs of rolls used in making ship channels and bulb angles, and of revising the American standard steel ship shapes, two conferences were recently held in Philadelphia. The first conference was between steelmakers while the second was between steelmakers and representatives of the Emergency Fleet corporation.

Representatives were present at these conferences from all the larger mills which manufacture steel shapes, including the Bethlehem Steel Co., Cambria Steel Co., Carnegie Steel Co., Eastern Steel Co., Illinois Steel Co., Inland Steel Co., Jones & Laughlin Steel Co., Lackawanna Steel Co., Phoenix Iron Co., Tennessee Coal, Iron & Railroad Co. At the second conference the United States Shipping Board Emergency Fleet Corp. was represented by Fred T. Llewellyn, in charge of steel standardization, engineering section, division of steel ship construction, and by A. J. C. Robertson, chief designer.

The first step in the direction of the standardization of ship steel was taken on July 2, 1917, when representatives of the companies mentioned, together with representatives of plate manufacturers, met in Washington and adopted the standard practice recommended by American steelmakers and subsequently adopted by the Emergency Fleet corporation as a guide to the shipyards in placing orders with the mills for ship steel. The effect of the standard practice has been to eliminate minute variations in the thicknesses of plates ordered from the mills and to simplify the transmission of orders. The situation as regards plates has been greatly improved and plate mills have been able to make some remarkable production records.

At the time the standard practice was adopted it was deemed inadvisable to prepare a selected list of structural sections, but only to recommend that in general the use of sections rolled infrequently be eliminated and that orders be confined so far as possible to American standard beam sections, American standard structural channels and plain angles, provided, however, that ship channels and bulb angles might be rolled if required on shipbuilders' schedules. While it was recognized that the bulb angle and the ship channel were more suitable than other sections for ship construction, the limitation in the use of ship channels and bulb angles was due to the lack of adequate facilities for their manufacture, and it was the desire of the steelmakers to make as broad as possible the allocation of ship steel to all makers.

It was further considered unnecessary to draft a selected list of structural sections for the reason that it was believed the Emergency Fleet corporation's plan for the standardiza-

tion of the designs of hulls, particularly cargo vessels, would of itself operate to reduce the number of structural shapes required, and, therefore, no further action was necessary. The recommended list, however, did limit the number of plain angles.

The experience of 16 months has made it clear to American steelmakers that the structural channel, by reason of its narrow flanges and steep inner flange slope, is not an entirely satisfactory section for use in hull construction. Further it has been found that the bulb angle is in many respects a most desirable section for ship construction and that its use should be encouraged rather than discouraged. Also the introduction of beams and structural channels into the list for ship steel had opened the way to the use of a large number of structural sections with relatively limited tonnages per section.

Difficult to Secure Steel

This situation had also come to the attention of the Emergency Fleet corporation by reason of the difficulties which, due to the use of a great variety of sections, the shipyards had had in securing an adequate supply of all those sections in due sequence as required in construction. In consequence an investigation was inaugurated in the division of steel ship construction, Daniel H. Cox, manager, with a view to the tabulation by tonnages, shapes and thicknesses of all the sections used at the yards so as to make possible the compilation of a selected list of sections for use in the construction of ships on the basis of which it might be possible to insure the receipt of steel in adequate volume and due sequence, and also to arrange for warehouse stocks of suitable sizes at conveniently located points.

The investigation which was carried on by Mr. Llewellyn covered 1508 hulls of 10,302,150 deadweight tonnage either requisitioned or under construction by the Emergency Fleet corporation, with a total shape weight of 1,100,651 net tons distributed among 131 different structural shapes in 403 thicknesses (sections). It was noted that in the case of one design for a 5000-ton boat with but 1,026,966 pounds of structural shapes there were 42 different shapes and 118 separate thicknesses (sections), of which nine sections were rolled only at one mill and one T-section only at another mill. Of separate sections there were items as low as 8 pounds each and 35 sections aggregating less than 500 pounds each. Of one shape only 43 pounds were required. If such tonnages were the only tonnage available at the mills for this particular shape, it would require material for 4600 boats to accumulate before consideration of economical production would justify placement of rolls.

Of another relatively heavy shape

on the same basis, economical production would require tonnage for 1000 boats to accumulate. In the case of another cargo vessel of 9400 tons, requiring 1,800,103 pounds of structural sections, there were only 16 separate shapes and but 44 thicknesses and of each separate shape the minimum quantity of any one thickness was 2800 pounds and that of a section in general use. The next smaller item on that list is three tons of a small angle section which would only require material for 66 boats to accumulate. By the addition of 55 tons to the weight of the steel the number of shapes in that particular boat might be reduced to 8 and the number of different sections to 19.

This investigation also indicated that while a number of steelmakers rolled bulb angles and ship channels, those sections represented the growth of years and reflected the individual ideas of the shipyards for which rolls were first turned. There had been no definite endeavor to standardize those sections, with the consequence that American steelmakers published different dimensions, weights and properties for sections of the same depth, the use of which at the yards should be interchangeable.

With the completion of his report and its distribution to the shipyards and to the steelmakers, Mr. Llewellyn recommended that ship channels and shipbuilding bulb angle sections be adjusted to British standards, that steelmakers confer and agree to publish like ranges of weights and dimensions, and that there be prepared for distribution to the yards a selected list of sections recommended as most suitable for ship construction.

The conferences were held in the offices of the Cambria Steel Co. with George E. Dix, assistant to the general manager of sales, in the chair. R. B. Woodworth, engineer with the Carnegie Steel Co., who had been instrumental in the formulation of the original standard practice, presented detailed written proposals as a basis of discussion for the modification and standardization of ship channels and bulb angles and for the revision of the American standard practice.

It was decided by the steelmakers that inasmuch as the British standard sections of ship channels and shipbuilding bulb angles appeared to be better adapted to economical manufacture than the American standards, and inasmuch as the new rolls which had been turned in recent years to produce those sections conformed in general to British standards, hereafter American standards should be discontinued and rolls on hand not to British standards should be redressed at as early a date as possible to roll such sections as closely to British standards as slightly divergent methods of production would allow; particularly in view of the

further fact that the adoption of British standard sections would enable American mills to compete on an even basis for ship steel wherever utilized in shipyards either at home or overseas.

It was further agreed that in general ship channel rolls would be dressed so as to produce the Lloyd minimum and maximum thicknesses with one thickness 0.05 inch less than British standards, and that mills publish but one intermediate thickness in the Lloyd range of ship channels, and that in bulb angles in general, where the Lloyd range seems to be too arbitrary and to provide an unnecessary number of thicknesses, the Lloyd range should be aimed at only in the deeper sections, that there should be but one thickness below British standards and that intermediate thicknesses be published to vary by 0.05 inch bulb angles to show exact leg dimensions at British standards and at 0.10 inch intervals above.

Approve List of Shapes

Careful consideration was then given to a selected list of structural shapes to be recommended for ship construction, together with those modifications in the standard practice which the experience of 16 months indicated to be desirable. These were further discussed at the second conference with representatives of the Emergency Fleet corporation and it was further recommended to the Emergency Fleet corporation that as soon as possible a technical order be issued to all shipyards to put these recommendations in effect and that so far as possible orders for structural sections to be used in ship construction be governed by the recommended list of sections, as follows:

EQUAL LEG ANGLES

Size	Thickness	Weight per foot
6 x 6	.750	28.7
	.6875	26.5
	.625	24.2
	.5625	21.9
	.500	19.6
	.4375	17.2
5 x 5	.375	14.9
	.750	23.6
	.6875	21.8
	.625	20.0
	.5625	18.1
	.500	16.2
4 x 4	.4375	14.3
	.375	12.3
	.750	18.5
	.6875	17.1
	.625	15.7
	.5625	14.3
3 1/2 x 3 1/2	.500	12.8
	.4375	11.3
	.375	9.8
	.3125	7.2
	.250	5.8
	.200	4.9
3 x 3	.1875	4.5
	.150	3.8
	.125	3.1
	.100	2.4
	.075	1.8
	.050	1.2
2 1/2 x 2 1/2	.025	0.6
	.020	0.5
	.015	0.4
	.010	0.3
	.008	0.2
	.006	0.1

2 x 2	.3125	5.0
	.250	4.1
	.200	3.19
	.1875	2.44

UNEQUAL LEG ANGLES

Size	Thickness	Weight per foot
6 x 3 1/2	.750	22.4
	.6875	20.6
	.625	18.9
	.5625	17.1
	.500	15.3
	.4375	13.5
5 x 3	.375	11.7
	.500	12.8
	.4375	11.3
	.375	9.8
	.3125	8.2
4 x 3	.500	11.1
	.4375	9.8
	.375	8.5
	.3125	7.2
	.250	5.4
	.200	4.5
3 1/2 x 3	.500	10.2
	.4375	9.1
	.375	7.9
	.3125	6.6
	.250	5.4
	.200	4.5
3 x 2 1/2	.375	6.6
	.3125	5.6
	.250	4.5
	.200	3.8
	.150	3.1
	.125	2.4

BULB ANGLES

Size	Thickness of Longer Leg	Weight per foot
10 x 3 1/2	.725	35.2
	.675	33.2
	.625	31.1
	.575	29.1
	.525	26.9
	.475	24.9
9 x 3 1/2	.625	28.6
	.575	26.6
	.525	24.8
	.475	22.7
	.425	20.9
	.375	19.1

SHIP CHANNELS

Size	Thickness of Longer Leg	Weight per foot
8 x 3 1/2	.550	23.2
	.500	21.6
	.450	19.6
	.400	18.0
	.350	16.3
	.300	14.6
7 x 3 1/2	.525	20.0
	.475	18.6
	.425	16.8
	.375	15.3
	.325	13.8
	.275	12.2
6 x 3	.475	15.6
	.425	14.1
	.375	12.8
	.325	11.3
	.275	9.8
	.225	8.2
5 x 3	.450	14.5
	.400	13.0
	.350	11.5
	.300	10.0
	.250	8.5
	.200	7.0
4 x 3	.425	13.8
	.375	12.3
	.325	10.8
	.275	9.3
	.225	7.8
	.175	6.3
3 x 3	.400	13.0
	.350	11.5
	.300	10.0
	.250	8.5
	.200	7.0
	.150	5.5
2 1/2 x 2 1/2	.375	12.3
	.325	10.8
	.275	9.3
	.225	7.8
	.175	6.3
	.125	4.8

6 x 3 1/2	.375	17.8
	.325	16.8
	.300	15.2

TEES

6 1/2 x 6 1/2	.450	19.8
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HATCH ZEE (Tyzack)

2 1/2	.500	13.6
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15-INCH STRUCTURAL CHANNELS

Thickness	Weight per foot
.818	55
.720	50
.622	45
Thickness	Weight per foot
.524	40
.426	35
.400	33

27 shapes—115 sections

Sections not shown in the list may be included on shipbuilders' schedules with the proviso that they be specified only when they can be ordered in lots of not less than 40,000 lineal feet per shape at one time, or by special arrangement with the mills. Orders for such shapes should not be divided among mills but the entire quantity of each shape should be placed at one mill with the express stipulation that that mill may at its option roll, ship and invoice all the tonnage at one time regardless of position in shipyards and fabrication schedules.

Reflects British Practice

It is to be noted in this connection that the same problem of the standardization of ship steel has had the careful attention of the British admiralty, the steelmakers and the shipyards of England where the multiplicity of sections specified on shipyard schedules has also interfered with the progress of ship construction. In consequence under the auspices of the admiralty and the ministry of munitions, to facilitate regular and frequent rollings and thus avoid delays, a list of standardized sections was drawn up. For cargo vessels (standard ships) this list includes but four sizes of angles—6 x 6, 6 x 3 1/2, 3 1/2 x 3 1/2 and 3 1/2 x 2 1/2; three sizes bulb angles—10 x 3 1/2; 9 x 3 1/2 and 8 x 3; and but two sizes of ship channels, a 12 x 3 1/2-inch light section and a 12 x 3 1/2-inch heavy section. For admiralty oilers (tankers) there are shown but four sizes of angles and six sizes of bulb angles.

While the number of shapes in the English list is much smaller than the number of shapes in the recommended American standard practice, English mills are accustomed to roll shapes with much narrower variations in thickness than American mills. In view of the desirability of the widest possible growth of ship construction in the United States it was thought inadvisable to restrict too narrowly American shipyards. The American list provides a larger number of shapes with fewer thicknesses.

The Skinner & Eddy Corp., Seattle, recently sent the steel steamer EDGECOMBE into the water in 51 days from the time of keel laying. This vessel is of 9600 tons and was launched in the same working time as the 8800-ton vessels the company has built recently.

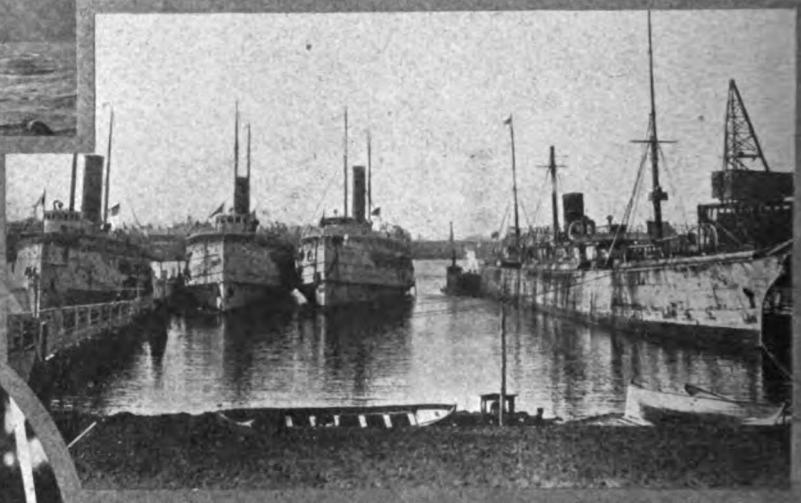
Photographs From Far and Near

Contributions For These Pages Are Solicited



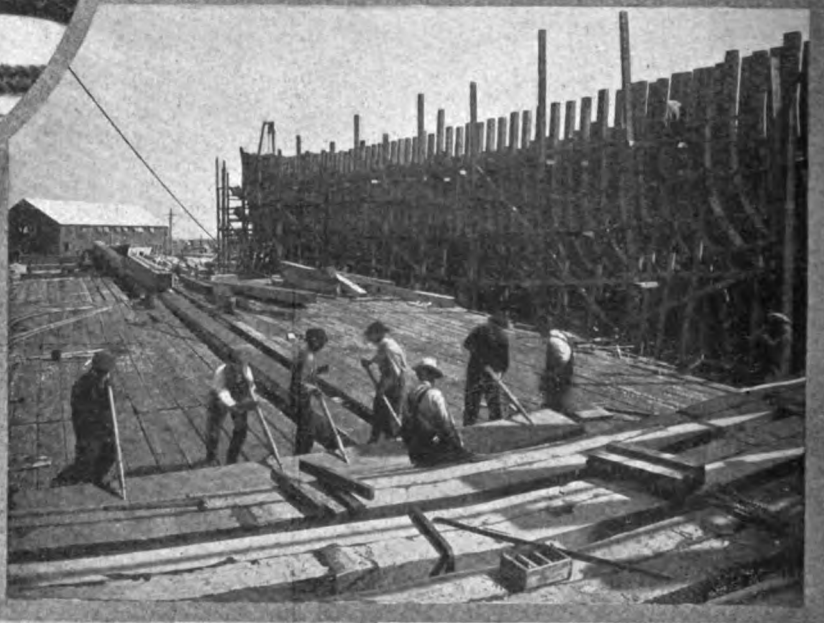
Full-rigged ship Flatbeck outward bound. Except for the main and mizzen topmast staysails in place of the fore and main spencers she looks like the old clipper ships.

Texas clergyman who instructs apprentice seamen. Before studying for the ministry he was a deep water sailor.



These fine passenger vessels are now used for training sailors. They accommodate 3000 apprentices and have a new complement each month. The vessel at the right is the old transport Meade and saw transatlantic service while the others are coasters.

All in frame and ready for planking. Six men with cant hooks are used to move this one futtock.

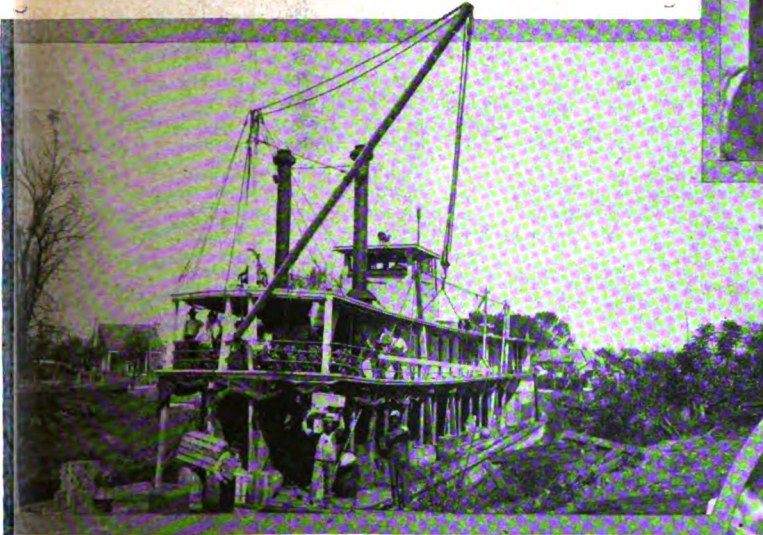


Noted American sculptor becomes tracer at Hog Island. Frederick E. Triebell who designed the Confederate monument at Vicksburg, Miss., at work at his drawing board.

Latest Marine News in Pictures

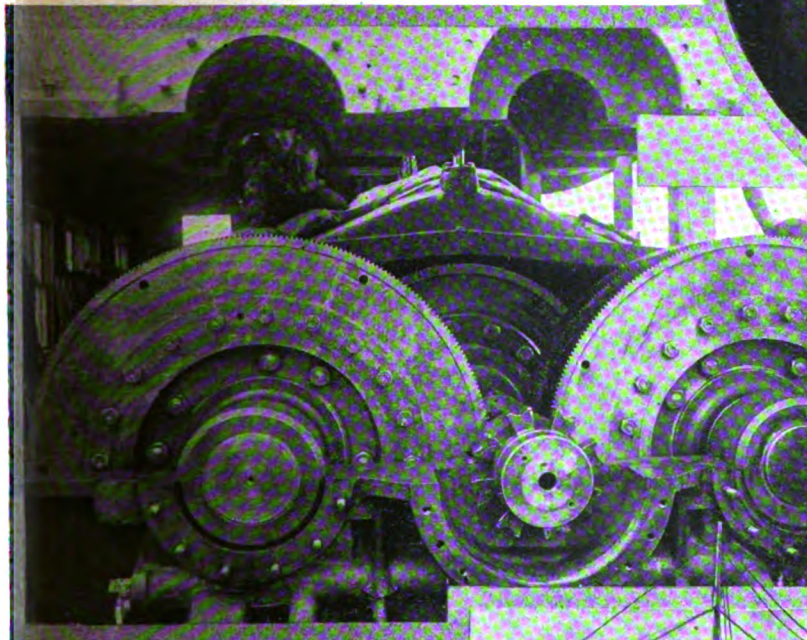
Payment Will Be Made For Acceptable Photographs

Seamen often become expert at intricate needle work. This Jackie is busily engaged in making a shawl, using a sailor's palm and needle to work his thread.



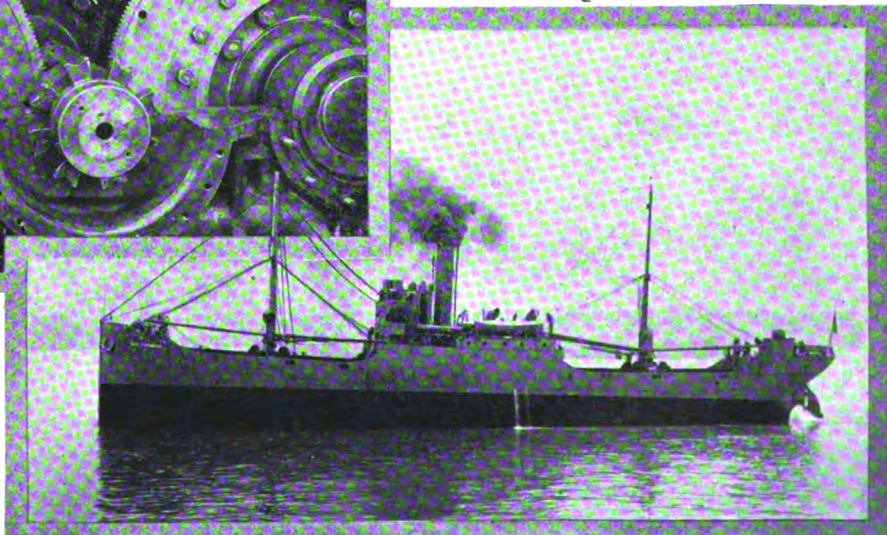
How Louisiana utilizes her waterways. Steamer Terrebonne delivering merchandise and taking on a cargo of vegetables and other produce consigned for New Orleans. Louisiana's rivers, bayous and canals afford means of cheap transportation.

Prince Axel of Denmark and his staff at Seattle when the 8800-ton West Eldara was launched.



Turbine engines require huge reduction gears. In this picture the cover is removed exposing the gears for inspection.

Steaming down the lake toward salt water. Lake Gorman, built at Detroit, enroute for the Welland canal. Many of her sister ships carried supplies to Europe for the allies.



Welding Designs for Shipyard Use

Practical Examples of Electric Welding in Deck, Tank and Bulk-head Structures—How Electric Welding is Applied to Armor Plate

By E. G. Rigby

THOUGH the covered-electrode process for electric welding was established a couple of years, and making steady progress in industrial manufactures and gradually making its way into the shipyards, it was not until after 1914, when the great war started and our dockyards commenced to fill with damaged steamers and naval units crippled in their riveting and caulking as the result of vibration from gunfire, that the possibilities of electric welding as a means for their rapid and effective repair came to be realized. It was first taken up by the royal naval dockyards, in a tentative way, but its successful application has now made it a most important part of every naval and private dockyard and ship-building plant. New and extended applications are coming into use every day. It was the writer's privilege to be associated with the work during this period, so gaining an experience that would not otherwise have been possible, ranging from the welding of a battleship's cast-steel stern frame, weighing upward of 190 tons, broken in the launching, to the ordinary everyday jobs of welding angle-iron staples.

In the English shipyards the covered-electrode process has been widely adopted for repairs of all kinds, in conjunction with the usual methods of riveting and smithing, for welding inside and outside seams for watertightness in place of caulking, reinforcing corroded plates in ships' bottoms, for oil tanks, bulkheads, cutting holes and welding studs in armor-plating for the attachment of bulges giving protection against torpedo attack.

In new construction work it has included the entire welding of sea-going hulls in place of riveting. In this, however, the way is being carefully felt, since the work is only in the initial stages and so far has been confined to the building of cross-channel barges of

large size used in carrying munitions to France. The first of these boats was launched on July 11, 1918, and was welded throughout by the covered-electrode process, no rivets being used. From the experience and confidence gained in this way designs will be made for more important ship constructions, but welding engineers are still of the opinion that the time has not yet arrived when it would be safe to weld throughout a ship of any size. It is confidently expected by prominent naval architects that the cost of material and labor in building a ship will be reduced by some 20 per cent when this time arrives. Even now 10 to 15 per cent can be saved by using welding to the maximum of the limits already known to be safe.

All the large munition, engineering and steel plants of England use electric welding for repairs and for making good defective and fractured castings and for welding the seams of buoys, submarine mines, aerial torpedoes, bombs, shells, etc. In this connection, hundreds of women are now engaged in welding by hand and automatic machinery, and similar methods have now been adopted here in this country.

Are Making Elaborate Tests

The work done by the covered-electrode process and the results of the many tests and experiments carried out by the British admiralty and shipbuilders with it, has resulted in the authorities of Lloyds registry taking the matter up, and they are at the present time engaged in making an elaborate series of tests and experiments with a view to determining its further application to the welded construction of ships, boilers, etc. These tests have now been proceeding for over six months, and it is hoped that the results will shortly be available and that a more liberal policy toward welding will then be adopted by the classification authorities.

In the course of these experiments they have confirmed the conclusions the welding engineers had reached by actual experience, and it was found that the

usual standard tension methods of testing welding were of little practical value, when considering the reliability of welding in connection with ship construction, where the stresses are almost wholly of a continuous alternating nature. It has long been established that metals, and particularly welds, will break under alternate stress at much less than their elastic limits under either tension or compression. Welds, which are hard and brittle, and which have little or no elasticity, are manifestly not suitable to withstand stresses of this nature, or to withstand the shock stresses which often may be due to collisions or falling weights, which permanently strain the structure beyond its elastic limits. Tests are now being devised by the classification authorities, and it is expected that they will insist that all welding processes and welding material to be used in shipbuilding shall be material or methods approved by them as having passed their tests. The requirements will probably be a reasonable resistance to breakage by alternate stressing, and that the welds shall withstand the shock of a weight dropped from a height sufficient to deflect the joint permanently without cracking it. The sooner indiscriminate welding with any old material or operative is stopped the better it will be for all concerned.

The wider adoption of electric welding in shipbuilding, wherever it can now be usefully employed, is a matter of supreme importance at the present time when the demand for tonnage is so great and urgent. In addition to the large reduction in weight of material for a given strength due to dispensing with the angle frame attachments, laps and rivets, there is an important economy in the lighter weight of plating which may be used owing to the fact that joints or seams of greater efficiency can be made by welding. It also brings in its train a reduction of the necessary man power connected with the skilled trades in punching, riveting, caulking and smithing, and a large saving in time and plant equipment as compared with present-day construction methods.

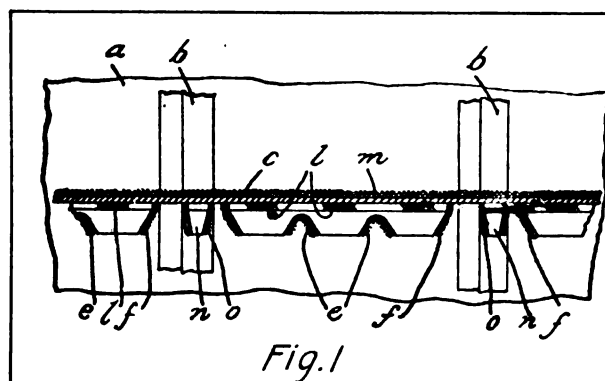


Fig. 1

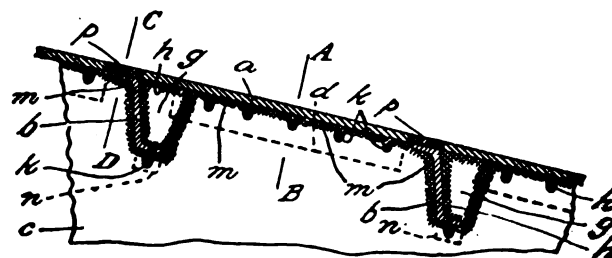


Fig. 2

PLATING AT THE SIDE OF A VESSEL AND A PORTION OF THE DECK SECTION IS SHOWN IN FIG. 1 WHILE FIG. 2 SHOWS A PLAN VIEW OF FIG. 1

The importance of forming a welded joint which contains no trace of oxide is so great as to deserve particular emphasis. Not only does the presence of oxide greatly reduce the strength of the weld and destroy its elastic limits, but it renders the joint peculiarly liable to corrosion, and in view of the importance which the subject of corrosion bears to that of welding, especially in shipbuilding or exposed joints, the following points are of interest:

1.—Fundamentally corrosion is electrolytic in character and depends on the difference in potential of contiguous areas.

2.—Commercial iron and steel contain areas which in the presence of an electrolyte, which may be merely atmospheric moisture, are capable of forming voltaic circuits, the necessary conditions being afforded by the presence of small particles of impurities, or by local conditions of strain in the metal itself.

3.—These impurities or strains give rise to areas of higher electrolytic potential, and form the electropositive points which are first attacked by the corroding agent. Thus in a caulked joint corrosion will commence at the caulking, and similarly a riveted joint will be attacked around the rivet head, owing to the local strains in the metal at these points.

4.—In a welded joint, if the metal at the weld be less pure than the surrounding metal, the weld will be first attacked. Similarly, if the added metal be not homogeneous, local differences in potential in the weld itself will cause corrosion at the weld.

The covered electrode process is different in method from the bare-wire-metallic, or carbon-arc fusion processes. The heat introduced into the weld is designed to be governed automatically by the nature of the special electrode, the covering of which in the solid state is a nonconductor, and in its molten state a good conductor of electric current. As a secondary conductor, the slag automatically maintains electrical connection between the work and the metallic arc of the electrode, serving to confine and maintain the direction and length of the arc, thus permitting a comparatively unskilled operator to hold a continuous arc.

How it Works

In operation, electrical contact is made by touching the work with the end of the electrode held vertically, thus allowing current to pass and an arc to form. The electrode, still kept in contact with the work, is then dropped to an angle, when the arc is immediately destroyed, owing to the special covering passing into the igneous state. The action once started, the electrode melts at a uniform rate so long as it remains in contact, and leaves a seam of metal diffused into the work. The covering material forming a slag, floats, and spreads over the surface of the weld as it is made.

These electrodes are composed of a metallic core, with a covering of blue asbestos yarn, which is a ferrous silicate, and in fusing acts as a reducing agent, and by excluding the atmosphere from the fused metal is designed effectually to prevent oxidation of the deposited metal. The yarn is coated with sodium silicate, aluminum silicate, or the like to vary the fusing temperature of the covering of asbestos yarn.

This covering forms a fusible insulating casing around the metal core of such thickness that the metal core is supported by it, when in contact with the work, at the proper distance, and thus to a large extent eliminates the factor of manual dexterity in maintaining an arc of the proper length while the electrode is fusing. In addition to the fusible insulating covering, the electrode has combined with it a small quantity of a different metal capable of exerting a strong reducing action, that is a metal such as aluminum having a strong affinity for oxygen at the temperature at which the welding takes place.

Aluminum Makes Good Medium

Aluminum is admirable for the purpose, and is applied in the form of a fine wire wrapped in the blue asbestos covering. The aluminum, as it fuses with the metallic core of the electrode, absorbs the small amount of oxygen which may be present in the slag, and is thus intended to prevent oxidation of the fusing metals. The aluminum formed readily combines with, and

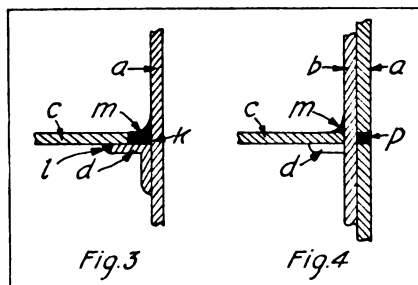


FIG. 3 IS A DETAILED VIEW SHOWING A SECTION ON THE LINE A-B IN FIG. 2, WHILE FIG. 4 SHOWS A SECTION ON THE LINE C-D IN FIG. 2

passes away with the slag, and so produces, in the hands of a competent welder, a homogeneous deposit in the weld. Owing to its reducing action, it also preserves to a considerable extent the original carbon content of the steel from any oxidation.

Steel plates or castings can readily be cut by the electrodes and this feature is useful when the oxygen blowpipe is not available. The method of procedure is to take a mild steel electrode, dip it in water, and with a relatively high current, apply the point of the electrode to the plate or piece to be cut. The point of the electrode must be moved quickly up and down through the thickness of the plate, and the molten metal allowed to drop.

In this process of arc-welding, any source of current supplying either alternating or direct current at a pressure of 100-110 volts may be utilized, and the maximum amount of current used by anyone operator will not exceed 200 amperes for the heaviest welding or cutting operations.

The rapid and wide adoption of electric welding in England and France, as also in this country, brought about by the necessities of the war situation, has led to a great demand for operators, and the irregular quality of the work produced, as the result of improper methods of preparation, and of employing partially trained workmen, directs attention to the reason why electric

welding has been so long in taking the prominent place in constructional work which its merits deserve.

Hitherto it has been the practice to hold out the statement that, by adopting electric arc welding, any handy man could do this welding work. While this may be true as regards some class of work more or less automatic, it certainly does not apply to such work as is found necessary in shipbuilding, or the welding required in the general and repair work of an engineering workshop. There has been no recognized trade of electric welding and no proper means of instruction for electric welders.

In the case of gas welding, which hitherto has had the field almost to itself, the trade has been better organized, and attention has been paid to instructing workmen properly and literature on the subject is plentiful.

In electric welding, however, it was usual to buy an outfit, turn it over to a handy man and expect him to turn out good work, right from the start, without instruction. If he failed, electric welding methods got the blame, and the outfit was put aside. This is the case even today. Welding with the electric arc is a trade of some skill, and requires both practice, to acquire the manual dexterity to manipulate it properly, and instruction in the proper use of the apparatus employed and the control and regulation of the current necessary to perform any given piece of work. Both the size of the electrode used and the mass of the work will vary in different jobs, thus necessitating different current flows and amounts of heat, as well as different methods of preparing the work, with all of which the operator should be familiar.

Such knowledge is only elementary, but it is necessary, to enable the operator to make any intelligent use of electric welding. Electric welding requires not only skill, but also a great deal of practice and experience and it is just as sensible to expect a handy man to do consistent work with it, without instruction and practice, as to put the same man to a blacksmith's fire and expect him to make first-rate forgings at the first attempt.

Facilities Must be Adequate

Failures are not always the fault of the workman. It is just as necessary to provide him with proper appliances and proper electric current conditions, as to provide the blacksmith with a suitable forge, fire and fuel. The writer has frequently been called to yards, even in this country, where complaints have been made that the welding was not satisfactory, and found that the trouble was wholly because the proper current conditions had not been provided. In one late case here, where a maximum of 110 volts was stipulated, the current was found to be 220 volts, and in addition the circuit was so overloaded that only the smallest diameter electrodes could be fused, and that only intermittently. One might just as well expect his blacksmith to weld 6-inch angles and give him a rivet-heating fire to work with.

In Great Britain most of the large shipyards and electric welding companies have arranged special classes and training shops to give men proper instruction and practice under competent welders before sending them out to do

work in the yards. It usually takes three or four weeks to acquire the necessary skill to handle the electrode properly in the various positions in which the operator will be called upon to work, and sometimes longer to acquire enough experience to know whether the work he is doing is sound or otherwise.

The idea at present seems to be fairly prevalent that the principal value of electric welding in a shipyard is to cover up mistakes, and that it can be used to make an efficient, welded joint no matter what its shape or width may be, so long as there is a crack or gap into which metal can be melted. This is fallacious and should be discouraged. As an instance, we were lately asked by the foreman of the welders in a shipyard to weld up a gap left by a shortage between two plates, which he had filled up by jamming a row of punch burrs into the gap, and when we objected he told us "that is the way we do it." Slipshod methods of this kind will have to go, if electric welding is to be recognized as an essential part of the shipbuilding industry, and the inspectors of the classification societies are doing good work by their conservative attitude while this state of affairs exists.

Careful Attention Necessary

Long seams and joints such as are necessary in welded ship construction, require careful consideration by the engineer, who will study the effects of expansion and contraction and make provision for it. Mechanically, such a seam is only a matter of careful intelligent assembly, just as is required for riveting. The edges of the joining plates must be prepared to shape with the same accuracy and care as the rivet holes now are, the various parts must be assembled, with the meeting edges of the plates in the positions they are to occupy permanently, by means of an ample number of temporary service bolts, hook bolts, male brackets or the like, exactly in the same way as for riveting. The holes required for the assembly will be filled up with studs welded in after the seam weld is completed.

When the assembly is complete, the plates should be tacked together at intervals by short welds, particularly at the ends, and to any frames with which they are to connect. The seam should be welded first along the bottom of the V with a small electrode and filled up afterwards with one or more runs of welding as may be required. The assembly bolts should be left in position wherever possible till the weld is completed. The weld should be inspected between each run of welding, and any bad or doubtful places cut out with a diamond-pointed air chisel before the next layer is put down. This gives a check on the welder as well as his work.

The purpose of this paper is to draw attention to certain particular methods of employing electric welding in ship construction, which renders such welding methods applicable and practically advantageous for these purposes, and it will be realized that it is necessary to deal with the problem of ship construction in detail, applying welding first in the manner which is most advantageous, in order to ascertain its practical advantages, and to test its utility under

all service conditions. The importance in the writer's view of the designs to which attention is now called, resides in the fact that they are the first, as far as is known, in which welding as applied to practical ship construction is considered in detail from the engineering point of view, while the designs have the further advantage that they can be tested without departing in any important respect from existing plans and practice in ship design, so that no practical risks are involved.

The design shown in Figs. 1 to 4 relates to deck constructions, bulkhead constructions and the like. In ship construction there are always frame members, usually of channel or Z section at intervals of about two or three feet

the frame members. The object of the present design is to provide an alternative method of fitting and fixing decks, bulkheads and the like in ships, designed to overcome these disadvantages with a saving in labor, material and deadweight.

Fig. 1 shows in elevation a portion of the plating at the side of a ship and a portion of the deck in section. Fig. 2 is a plan of Fig. 1. Fig. 3 is a detailed view showing a section of the line A-B of Fig. 2. Fig. 4 shows a section on the line C-D of Fig. 2.

In the drawings, *a* is the ship's plating, for example, at one side of the ship, *b* are the frame members extending upwardly and downwardly, and *c* is the deck to be inserted. Between each frame member and the next an angle-iron bracket *d* is fitted, being held in position against the ship's plating *a* by welding deposits as at *e*, Fig. 1, in notches cut in the vertical webs of the brackets, and by welding deposits *f* at the chamfered ends of the brackets.

Rigid Construction Necessary

One object of cutting the notches *e* and welding up to their tips is to insure that the brackets *d* are supported near the top, and will not therefore be liable to be torn away from the plating by any weight resting on the deck, which in turn bears upon the projecting tops of the brackets. The notches may be cut in the webs of the brackets *d* at intervals of say six inches apart, and they may be of any convenient shape, but an inverted V-shape with a rounded end is generally the most suitable in practice. The brackets are not required to extend at each end up to the upright frame members *b*, but they may be cut in lengths from straight angle bars so as to fill approximately the gaps between the frame members *b*. The tops of the brackets *d* are at the level to support the deck directly. Small additional brackets *n* may also be applied to the faces of the frame members *b*, at the same level as the angle-iron brackets *d* in order to support the deck at the faces of the frame members. The brackets *n* are welded to the frame members *b* by fillets of deposited metal *o*, as indicated in Fig. 1. The irregular internal sections of the frame members *b* are filled in at the level of the deck *c* with insertions *g*, Fig. 2, these being welded into the section of the frame members *b* by fillets of welding metal *h* around the inside of the frame members and against the ship's plating *a*. The insertions *g* when fitted in this way fill up the gaps in the frame members at the level of the deck *c*, leaving a plain or simple nonre-entrant section around which the deck can be fitted easily and closely.

The deck may be assumed to be made up of metal plating which is riveted or welded together in any convenient manner. It may be treated as if it were a single plate for the purposes of this design. When the deck is inserted it fits against the sides of the ship's plating and around the brackets *b* and insertions *g* as shown, and it is first welded down on to the tops of the brackets *d*, and the brackets *n* also if desired, by welding deposits applied as at *k* in notches or slots cut at convenient intervals in the edges of the deck, Fig. 2. Alternatively or in addition, the deck might be welded to the

Remove Restrictions on Exports and Imports

Resolution adopted by the National Foreign Trade Council, Nov. 25, 1918

WHEREAS, the cessation of hostilities has produced demands upon American foreign trade which it will be impossible to meet under the restrictions imposed in the execution of the system of exports and imports control made necessary by our participation in the war; and freedom from war necessities renders feasible the early removal of such restrictions;

THEREFORE, BE IT RESOLVED, that pending the complete removal of all war restrictions the National Foreign Trade Council urges the closest co-ordination between the army, the navy, the war trade board, the United States shipping board and the food administration, for the purpose of minimizing the disadvantageous effects of such restrictive measures as it may be necessary, because of shortage of vessel tonnage or other sufficient reason, to continue temporarily.

apart inside the plating of the sides, and in order to build in the deck it is necessary to cut the deck so as to fit over the frame members. Angle-iron collars are forged to fit inside the channels of the frame members, around the frame members, and along the plating between them, the collars being riveted to the ship's plating and the frame members, and riveted also to the decks. It is usually required to make bulkheads and partitions also to fit against the ship's sides in the same way by the use of angle irons fitted around and between any brackets and stringers, and riveted to the plating and the bulkheads. Then it is necessary to make such decks and bulkheads watertight by caulking the joint lines between these and the decks, and all the rivet heads, but even so, it is difficult to caulk every joint effectively, particularly around the longitudinal stringers. The result is that there is a certain amount of leakage which may steadily become worse, owing to the inevitable relative movements due to the working of the ship, and also creaking is liable to occur due to relative movements, particularly against and around

flanges of the brackets from beneath by fillets of welding metal deposited at *l* in Fig. 3, but this is not generally necessary. Then a line or fillet of welding metal is deposited all round the edge of the deck as indicated at *m*, both against the ship's plating *a*, and around the brackets *b* and insertions *g*. In this way the deck is completely welded and hermetically sealed in place in the ship, so that no subsequent caulking or labor of any kind is required upon it to make it watertight.

Water might still find its way between the frames *b* and the ship's plating *a* unless they were packed with jointing material which is not permanent, and in order to render impossible leakage of water at this point it is preferred to cut slots in the plating *a* from the outside adjacent to the frame members at the level of the decks, and to weld the frame members and plating together through such slots as at *p*, Figs. 2 and 4. In this way, a complete line of welding is formed at the deck level along the ship's plating.

Method for Welding Bulkheads

The fitting of bulkheads in place is effected in exactly the same manner as for the decks, upright angle brackets being welded to the ship's plating, and the bulkheads being welded to such brackets and to the plating. If Figs. 1 and 2 are regarded as being turned through 90 degrees they will represent the insertion of such a bulkhead, the frame members *b* being then horizontal frame members which occur at intervals inside the ship's plating.

The design shown in Figs. 5, 6, 7 and 8 relates in particular to the method of inserting the vertical keel plates, the longitudinal partition plates, the intermediate cross partitions or plates, and the inner shell which is carried on or secured to the framework formed by such plates. Hitherto it has been usual to secure the vertical keel plates and partitions in place by means of angle-iron brackets riveted to the keel and the ship's bottom plating, and to secure the inner shell plating of the ship to such vertical plates by brackets riveted to said plates and to the inner shell. In order to make the structure water and oiltight it is necessary to caulk every joint and all the rivets.

In welding it might have been thought that it would be sufficient to employ angle irons as before, and merely to weld them instead of riveting them in place, and this has been previously proposed, but though this might present some advantages it does not provide nearly so strong or effective a structure as is provided by the construction shown in this plan.

Fig. 5 illustrates in perspective, and partly broken away, a portion of a ship's bottom and inner shell plating or false bottom, with the intervening keel and partition plating. Fig. 6 shows in perspective a slight modification. Figs. 7 and 8 are two views at right angles showing another modification.

Referring to Fig. 5, the ship's bottom plating is marked *a*, and the inner shell plating *b*. A portion of the vertical keel plating is shown at *c*, while *d* is another longitudinal line of partition plating, and *e* is the intermediate cross-partition plating. The vertical keel plate *c*, and the longitudinal partitions *d* are laid along the bottom plating *a* of the ship,

and are fillet-welded thereto along their bottom edges at both sides, as indicated at *f*. The transverse intermediate partition plates *e* are similarly placed and welded, both to the ship's bottom plating as at *f*, and also to the longitudinal partitions *c* and *d*, as shown at *g*. The joints so made would not effectively resist racking stresses, but the necessary strength and rigidity is obtained separately, by making struts *h* of angle or T-iron, and welding them at intervals to the vertical keel plates *c* and partition plates *d* at the one end, and to the ship's bottom plating *a* at the other end. The struts may be shaped from suitable section irons, with ends at the proper angle to the middle portions in order to lie flat against the plates to which they are to be welded; and the welding is done either around the ends of the struts as

plates as shown, or in staggered positions as may be preferred, and will be fixed at intervals apart depending upon their strengthened section. Similar struts *i* may be arranged and welded in horizontal positions at the corners where the longitudinal and transverse partition walls meet.

It will be seen that the structure depends to a large extent for its rigidity on the struts, and that these play no part in rendering it fluid-tight. The fillet welds *f* along the lower edges of the plates and at *g* between the longitudinal and intermediate partition plates, serve this latter purpose in an entirely effective and permanent manner, while at the same time they prevent any possibility of movement or shearing between the vertical plates *c*, *d* and *e* and the ship's plating *a*.

The vertical keel plates *c*, the longitudinal partitions *d* and transverse intermediate partitions *e* form a structure or framework which provides a number of oblong cells or spaces, and instead of forming the inner plating or bottom *b* of the ship so as to lie over this, the inner plating is fitted as follows: Angle brackets *l* are welded to the vertical keel and partitions *c*, *d* and *e* at intervals, preferably by notching or slotting the vertical webs of the brackets at suitable points as at *m* and welding the edges thereof to the vertical plates, and then filling in the notches or slots with deposits of welding metal so as to provide solid supporting pieces. The tops of the brackets *l* are disposed the plating-thickness below the tops of the partitions *c*, *d* and *e*, and templates are cut to fit in the cells, the inner plating *b* being made up in complete sections therefrom, one section for each cell of the partition structure. The inner plating sections *b* may have chamfered edges as shown in Fig. 5, and when they are inserted, deposits of welding metal are made at *n* to fill in the V-shaped spaces and to weld the plating *b* to the vertical keel and partition plating *c*, *d* and *e*. The plates *b* are also preferably slotted or notched at intervals at or near their edges as at *c*, and are welded to the tops of the brackets *l* by deposits at these points before the edges of the plates are welded all round as at *n* to the vertical plating *c*, *d* and *e*.

In the alternative construction shown in Fig. 6, the brackets *l* are of such a height that the inner plating *b* when inserted, stands up half-proud of the vertical plating *c*, *d* and *e*. After the welds in the notches *c*, holding the plating *b* to the brackets are made, fillet welds are then made around the entire edges of each section of the interplating *b*, upon the tops of the partitions *c*, *d* and *e*, and these joint lines are finally filled in also with welding metal as at *p*. The result is to form an inner plating for the ship, in sections *b*, which are completely welded to the partition walls *c*, *d* and *e*, and are also welded one to another along their edges, so that a very strong and rigid structure is provided which is completely fluid-tight, without the necessity of caulking.

The structure is substantially the same for the partition plates and inner plating of the ship as far as these are carried up the ship's sides past the bilge keels, except that in the dies there is not the same necessity for making the longitudinal partitions all fluidtight, and one line or fillet of welding on the

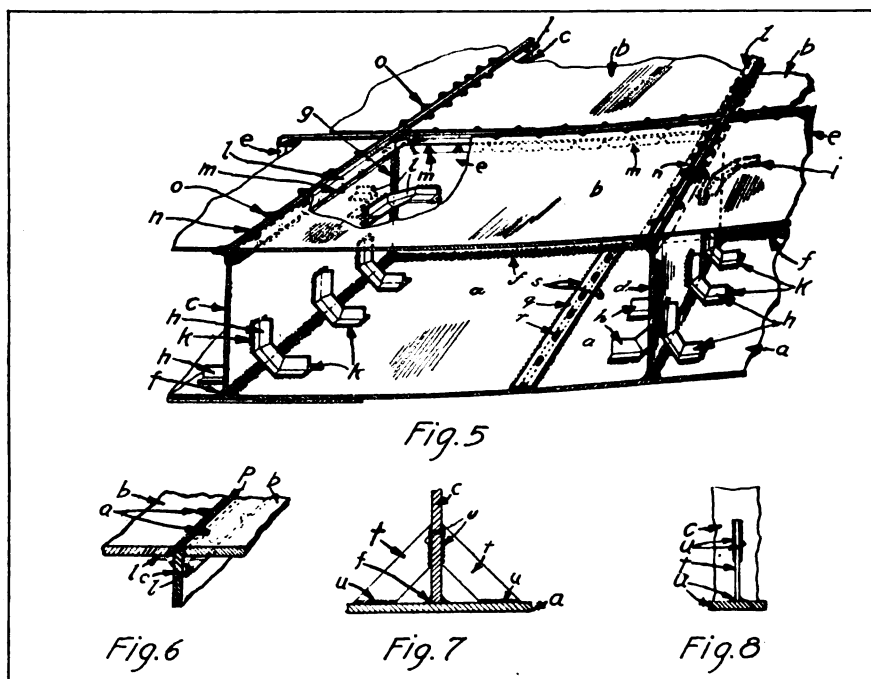
Should Complete Ship Construction Program

Resolution adopted by the National Foreign Trade Council, Nov. 25, 1918

WHEREAS, the destruction and loss of vessels during the war leaves the world total of ocean shipping upward of 10,000,000 gross tons less than it was four years ago; and the rehabilitation of war ravaged territories, the reconstruction work of all the belligerent nations and the restocking of the neutral markets of the world call for the services of more tonnage than is now in existence plus what can be produced for some time to come:

THEREFORE, BE IT RESOLVED, that the National Foreign Trade Council respectfully urges upon the President and the United States shipping board the wisdom of continuing the program of the shipping board for the construction of merchant ships, including cargo and passenger carriers of various types, without any abatement, until it has been completed.

indicate at *k*, or through slots or notches cut therein, or in both of these ways. Instead of struts *h*, plain gusset plates *t* may be used, these being cut from metal plates and welded around their ends as shown at *u* in Figs. 7 and 8. The term "struts" where used hereinafter, is to be read as including such gusset plates. In the welding of these struts, owing to the fact that the struts are of much less mass than the plates, they become more highly heated, and therefore expand more than the plates. On cooling after the welding, therefore, the struts *h* or *t*, which extend at an angle from the vertical keel and partition plates *c* and *d* to the bottom plating *a* of the ship as shown, tend to contract more than the plates, with the result that all the struts are left in tension while the vertical keel and partition plates *c* and *d* are in compression between the ends of the struts and the ship's bottom plating *a*. Hence a rigid trussed structure is formed which is admirably adapted to resist all racking, bending or vibrational stresses. The struts may be placed in pairs at opposite sides of the vertical



FIGS. 5 TO 8 SHOW THE METHOD OF INSERTING VERTICAL KEEL PLATES, LONGITUDINAL PARTITION PLATES AND CROSS PARTITION PLATES—THE INNER SHELL IS ALSO SHOWN

upper edge of each partition plate may suffice, while the flanges of the struts on which the plates rest may be welded from above to the partition plates through slots therein. The construction set forth has an advantage in saving deadweight, and consequently in reducing the displacement of the ship.

In the construction of inner plating, mortise and tenon joints, see Fig. 9, the inner plating, floors and so forth, are applied in lengths, extending over the partitions, while fitting thereon by mortise and tenon joints which are secured by welding. In addition, where required, watertightness may be secured by fillet welding along the angles or junctions between the partitions and the plating, or along portions thereof not already welded.

Mark on Partition Plates

The partition plates are formed with projections at intervals constituting tenons. This may be done before the plates are inserted, by punching out the intermediate portions at the inner edges of the plates so as to leave the required number of projecting tenons, or in any other convenient manner according to circumstances. One possible alternative is to weld tenons to the tops of the partitions, or into slots cut therein. When the partition plating is complete, with such tenons projecting therefrom, the inner plating in convenient lengths is laid thereon, having been shaped and punched or slotted in advance with mortise slots to fit over the tenons on the partition plating. The slots are made substantially longer than the tenons so that great accuracy is not required in cutting. The welding is then effected by deposits of welding metal in the slots around the tenons and at each end. In order to hold down the plates during this welding any convenient forms of temporary attachment devices may be used, for example hook bolts engaging in the limber holes and other holes in the partition plating may be used, these bolts projecting through

holes in the plating to be welded on, and being tightened by nuts from above. The hook bolts can be removed when the welding is completed around the tenons in the mortise slots, and the holes where the hook bolts have been placed can be filled up if required, for example, in the case of oiltight or watertight plating, with plugs driven in and welded over, or in any other convenient manner.

It is important that the mortise slots should be substantially longer than the tenons in order to enable the welding metal to connect the partition members to the plating throughout the thickness of the latter; the slots are also wider than the tenons, to allow of welding along each side thereof, in a V-shaped space or otherwise. Each tenon may be divided into two or more projections with welding between them if preferred. The inner plating, tank tops, floor and the like, can be made by this method in sections of any convenient length or breadth, and secured upon or against the partition plating by welded mortise and tenon connections, both longitudinally and transversely. One section of the plating can be connected to another by welded butt joints, welded lap joints or welded butt strap joints, whichever may be most convenient or suitable in any particular case. When the connection between the inner shell plating, floors or tank tops and the partition plating is to be made watertight at any particular line of connection where mortise and tenon joints have been made, a fillet of welding metal will preferably be deposited at the under side of the plating against the partition walls, either throughout the whole length or only in the intervals between the tenons.

The method of mortise and tenon welding provides the strongest and simplest form of joint, and involves comparatively little welding, much welding being of an easy character as it is in slots open above.

Where the ends or sides of lengths or sections of the plating are to be

connected together in position not coinciding with a partition wall, it depends upon the strength required in the joint which type of joint shall be adopted. A plain abutting joint is sufficiently strong for many purposes, the abutting edges of the plates being preferably cut to a V-shape to receive the weld of deposited metal. In the case of a lap joint which will give greater strength as a rule, the edge of one plate will generally be joggled to overlap the other, and a complete fillet weld will be run along the overlapping edge at the top, while, if necessary, welds at intervals may be provided along the exposed edge from beneath, or even a complete fillet underneath. This will rarely be necessary. If a butt strap is used applied from below, it will be held up generally by service bolts at a few points, the plate edges to be joined being preferably spaced a short distance apart so that the slot thus left can be filled in with deposited welding metal uniting the butt strap to both plates, and uniting the plates directly. The service bolt holes are afterwards filled in with welded plugs or otherwise, when required.

However the plates are jointed together, they are secured by the mortise and tenon joints in a strong and effective manner to the partition plating, while they are not weakened by rivet holes, and a substantial saving is effected in deadweight and in labor involved in construction.

Repair Work Develops Methods

The remaining sketches, though illustrating simple constructions, are the result of an immense amount of thought and numerous experiments arising from the exigencies of the British dockyards in dealing with the necessary repairs to the many naval units of all descriptions, which came into port after engagements, with their caulking and riveting damaged as a result of the vibration and shock stresses of heavy gunfire. The ships were needed with the least possible delay in dock and arc welding was finally resorted to in many cases.

The design shown in Figs. 10 to 16 relates to metal plate structures of ships, tanks, and the like, which are required to be watertight. In structures of this character which are liable to be subjected to heavy stresses, no caulking can be permanently effective, and it is liable to break down quickly in structures such as plated vessels after heavy gun firing. What is required in order to render such a structure watertight, is to provide some form of elastic sealing medium which will cover all of the joints, and will not be destroyed by the maximum strains and deformations to which the plating structure is liable. It is the object of this design to attain the result with a metallic structure, using methods of welding for securing the projecting sheets.

Can Use Thin Sheets

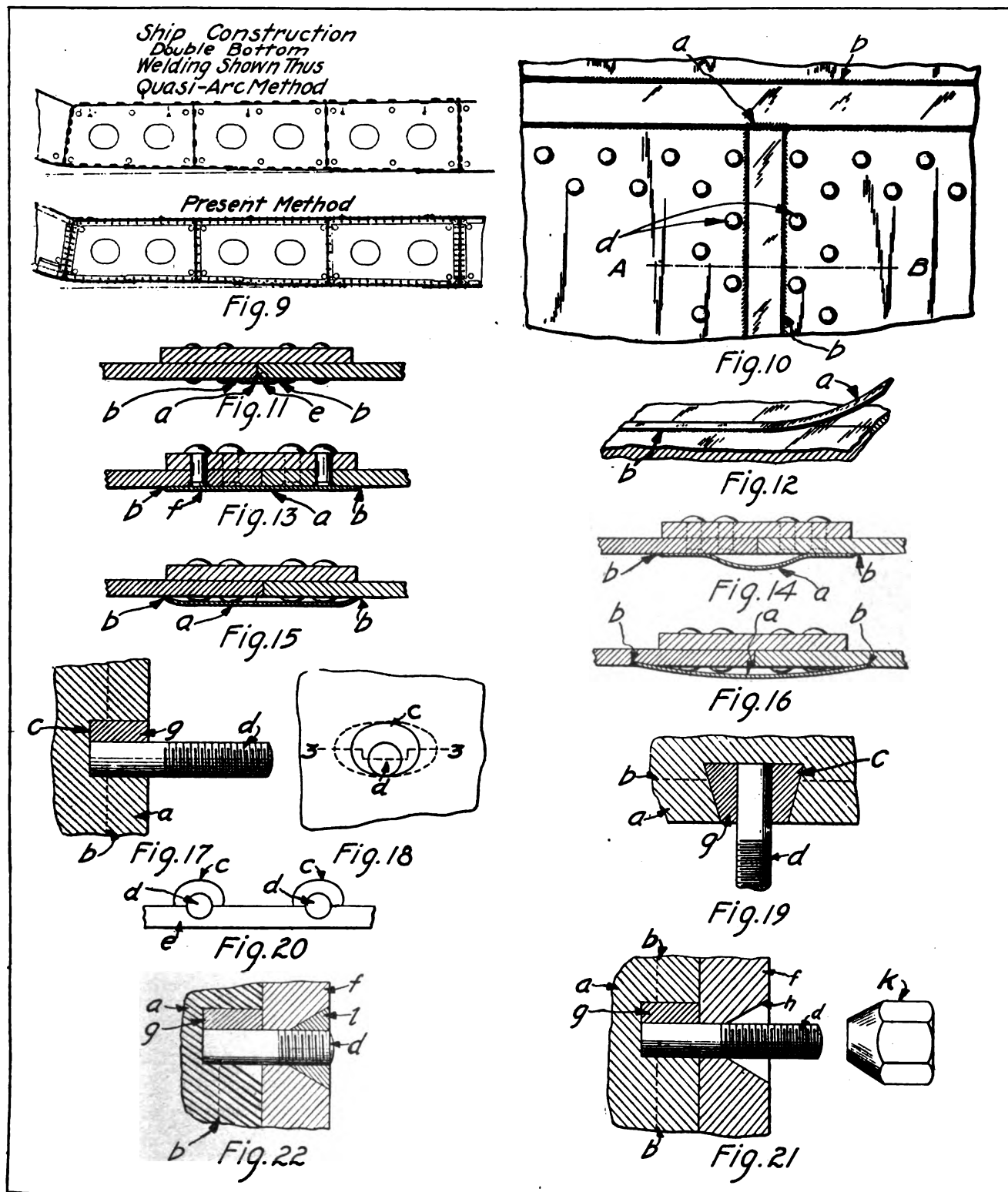
Comparatively thin and flexible metal sheets are used which will cover the joint lines, the sheets being welded to the plating in order to eliminate all risk of leakage. In preparing sheets for the purpose rolled steel plates may be used of a comparatively thin gage, for example, No. 12, and these sheets are annealed throughout in order that their

consistency may be as uniform as possible after welding. They are laid over the joint lines and are fillet-welded at their edges to the plates at each side of the joints.

Figs. 10 and 11 show riveted plating with comparatively narrow steel strips *a* laid over the joint lines and welded at each side to the plates by means of deposited fillet welds at *b*. Where one strip meets another over a plate joint,

the end of the abutting strip is welded to the edge of the outer strip or to the plating. In Fig. 10 the applied strips *a* may be only, say from 1 to 2 inches broad so that they will lie inside the lines of rivets *d*, as shown. The steel strips *a* can be fed down against the surface of the plating as they are being welded, in the manner illustrated in Fig. 12, the ends of successive strips being united by welding where more than

one length of strip is required for a joint. The resultant structure is watertight and will withstand high stresses without showing any signs of leakage. With stresses large enough to open the joints somewhat, the thin annealed steel strips can extend or bend transversely to the extent required without their welded edges breaking away. Even with no caulking between the edges of the plates of the structure, therefore,



IN FIG. 9 IS SHOWN THE CONSTRUCTION OF INNER PLATING MORTISE AND TENON JOINTS WHILE FIGS. 10 TO 16 ILLUSTRATE METAL PLATE STRUCTURES OF SHIPS' TANKS, ETC., THAT MUST BE WATERTIGHT—FIGS. 17 TO 22 ILLUSTRATE HOW FITTINGS ARE ATTACHED TO HARDENED STEEL SURFACES SUCH AS ARMOR PLATING

it is a great improvement on existing plating structures as regards resistance to opening up of the joints and risk of leakage. The actual joint line may also be caulked, for example, at *c*, Fig. 11, before the steel strip is applied with a run of deposited welding metal whenever this is considered desirable, and this will further strengthen the joint and increase its resistance to opening stresses. Mechanical caulking can also be used.

The applied strips *a* need not necessarily lie flat against the plating, but they may be buckled outwardly somewhat from it in order to allow freedom of expansion, or slightly waved or corrugated in a direction extending along the joint line. This is illustrated in Fig. 14. If the rivet heads project, as in Fig. 15, the steel strips may be bent inwardly at their edges beyond the rivet lines and welded there. This also provides an element of flexibility in the middle part of the strip which is held out at a little distance from the surface of the plating.

The edges of the covering strips may also be let into recesses in the metal plating, if desired, as indicated in Fig. 16, but as a rule this should not be necessary as the fillet welds *b* at the edges will prevent any sharp corners being left.

In any such cases as those of Figs. 14, 15 and 16, wherein the strips are curved and extend away from the plating surface over part of their width, the ends of the strips may either be flattened down to enable them to be welded to the plating or to crossing strips, or such crossing strips may have their edges lifted to apply them to the ends of the first mentioned strips, whichever may be most convenient.

The attachment of fittings to hardened plate surfaces relates to methods of securing attachments to iron or steel plating which is too hard at its surface to permit of drilling and inserting studs, bolts and so forth.

Fig. 17 shows in section the method of securing a stud in the plating. Fig. 18 is a face view of one of the holes with a stud therein. Fig. 19 shows a cross section on the line 3-3 of Fig. 18. Fig. 20 shows a jig for holding several studs ready for welding in place. Figs. 21 and 22 are sectional views corresponding to Fig. 17 showing subsequent stages in the operation.

In the drawings, *a* represents a surface-hardened plate such as armor plating. In this the hardening extends say for one and a half inches inward from the surface as indicated by the dotted line *b*. Nothing can be secured to this surface by welding, as the welding deposit, if applied, merely breaks away a portion of the hardened metal with it when any stress is applied to it. If, however, the high-carbon steel at the surface could be pierced, the milder metal at the rear would serve for effecting a secure attachment by welding.

Attaching Fittings to Armor Plate

Holes are burnt or fused out at the required distance apart for studs, which will provide a secure attachment for the further plate or other object to be mounted on the hardened plate. For burning the holes through the hardened layer of metal the electrodes are preferably moistened in order that an oxidizing action may take place, and a heavier

electric current is used than is required for effecting electric welding. In this way a series of holes are formed preferably of the shape indicated at *c* in Figs. 17 and 19, and extending to a depth well beyond the plane indicated at *b*, where the surface hardening ceases. The holes are oval in form and undercut at the ends, so that when a stud such as *d* is laid in one of the holes, there will be space enough above and at each side of it for inserting and manipulating a welding electrode in the hole. A series of such studs is placed in the row of holes, and held in the right position for fitting in corresponding holes in the object to be attached; the holding may be accomplished by the use of a suitable support or jig such as is indicated at *e* in Fig. 20. Each hole *c* is then filled up solidly around the stud *d* with welding metal, built up from the rear, where it coalesces with the milder backing metal or the armor plate *a*, until a conical-ended block *g* of metal is formed, welding the stud *d* to the backing metal, and boring it into the hardened surface metal so that it cannot possibly pull out.

Studs Should be Threaded

The studs *d* are all preferably screw threaded, as indicated, and the object to be attached, for example a further plate *f*, is now applied, with its ready-formed holes fitting over the studs *d* as they project from the plate *a*. The holes in the plate *f* are countersunk at the front as at *h*, Fig. 21, and nuts *k* preferably formed with coned ends as shown in Fig. 21, are now applied to all the projecting studs, and are screwed up tightly to secure the plate *f* firmly in position. The surfaces of the welds *g* are, of course, smoothed or filed flat if necessary, before the plate *f* is applied.

Finally, the nuts *k* are removed one by one, and the annular spaces provided by the chamfered holes *h* are filled in with deposits of welding metal *l*, Fig. 22, which draw the plate *f* even more tightly against the plate *a* as the heated studs *d* and the deposited metal cool. Removing the nuts *k* only one by one as the welds are made, prevents any risk of the stresses due to the heating and cooling in the welding operation distorting the plate *f* and so interfering with its proper positioning. When all the welds are made, or as each nut is removed and before the welding which replaces it is effected, the projecting ends of the studs *d* can be cut off flush or nearly so, leaving a finished attachment such as is seen in section in Fig. 22.

If the object *f*, which is secured, is a bracket or the like, it can be employed in turn for supporting any other object or plate which it is required to mount upon the hard-surfaced plating *a*. The holes *c* are not necessarily of the precise shape shown, and they might be circular and conical, for example, with the studs *d* placed at the center. This would usually necessitate the use of larger holes and would result in more labor and expenditure upon electrodes in the cutting and subsequent welding operation, so that holes of the general shape indicated are preferred.

The undercutting is important in keying the welding deposits *g* in position, but it is of even greater importance to insure that each hole *c* extends beyond

the very hard surface layer of the plate *a* into the milder metal at the rear, otherwise no reliable attachment could be made. The studs *d* are not necessarily placed in straight rows, of course, but their number and disposition depend upon the form and mass of the object to be attached, or the stresses to be borne subsequently. For some purposes possibly it might be sufficient to leave the nuts *k* to support the object *f*, without replacing them with welds such as *l*, but for most purposes such welds will be required to secure the attachment in a permanent manner and to secure the object *f* in the strongest possible manner to the plate *a*. The inner ends of the studs *d*, instead of being cut off straight as indicated, might be chamfered or rounded to allow the welding metal to flow behind them; or if preferred they might be slightly enlarged with the object of keying them in turn into the deposits *g* rather than depending entirely upon the welding together of the metal of the studs and of the deposit *g* to hold them. For most purposes the conical-ended studs *d*, as indicated, are sufficient.

In this matter a great deal of thought and consideration was given. The method of attaching armor plates by the use of bolts and nuts was not effective against torpedo boat attacks in the North Sea, and the proposition was made to attach armor plates to vessels what are known as bulges. Bulges are ponderous attachments which come above the waterline and extend some distance below, forming a space about 8 or 10 feet from the ship's bottom at the waterline and below. When a torpedo struck such a bulge, it was exploded in the air-tight outer port of the bulge, the force of the explosion was expended on the water and the air-tight space on the inside of the bulge and the energy was expended in the water through hose provided for escape of the water at the top of the bulge, so that when a ship was hit by a torpedo a fountain of water would escape as high as the boat. The plan was effective in the protection of ships. Quite a large number of the ships were provided with protection of this kind. It used to take an enormous amount of time to make holes in armor plate and the difficulty was to make any kind of an attaching bracket or bulge arrangement to hold bolts to. Direct welding was attempted with the result that the bolts pulled out the armor plates. It was attempted to burn holes in armor plates, but the diffusion of heat was so great it caused the armor plates to warp where the heat was applied, and the method had to be abandoned.

Finally the suggestion was made to cut a round hole with intense heat with a cold electrode. This was successfully tried, then tested and adopted on all that type of protection as indicated in Figs. 17 to 22.

Welded Joints Are Strong

Tensile tests throw but little light on the value or reliability of welded joints in ship construction when the stress is wholly of a complex description. The nature of continuous alternating stresses under which the average welds break down with stresses very much below their elastic limits, under

tension or compression, a condition which is far more pronounced with some of the systems and materials used in electric welding than others, and particularly under a system permitting anybody to weld anything with anything.

Now that the classification societies like Lloyds, the electric welding committee of the Emergency Fleet corporation, with the co-operation of the national research department, the engineering staffs of the great naval dockyards and private shipbuilders both in England and America, are carrying on experiments and research, the old order of things will soon go. Only that kind of welding and welding material that is scientifically approved and adopted by them will be permitted, and this under strict rules and regulations. Only then can we expect to see electric welding come into its own.

Book Review

Shipmasters' Medical and Surgical Help and First Aid, by William Johnson Smith and Arnold Chaplin; cloth; 335 pages, 5 x 7½ inches; published by Charles Griffin & Co., and furnished by THE MARINE REVIEW for \$2.25.

On the ship's surgeon and on the master, in cases where vessels do not carry a surgeon, rests the responsibility of the health of all on board. For this reason, many books on medicine and surgery have been written for use on board ship.

The book under discussion is now in its fourth edition. Recent advances in knowledge of the causes of disease, especially those due to tropical conditions, have been utilized and portions of the book that deal with these subjects have been rewritten.

The chapters dealing with surgical matters have not been changed and the clear descriptions and advice given by the authors in earlier editions have been retained. The scales of drugs and surgical appliances issued by the board of trade (England) in January, 1912, have been incorporated.

The book is clearly written and is devoid of theoretical discussions, the whole matter being written with the object of imparting information in plain every-day English. Practically every disease prevalent among seamen is described and from the information imparted the layman should be able to diagnose many common ailments quickly, and treat them in an intelligent manner.

An appendix is added to the book, which contains much valuable information on various subjects pertaining to the practice of medicine at sea.

Greenville, Miss., has completed a new city wharf at a cost of \$75,000 especially to handle traffic to and from the new government-owned barge line. The wharf has a frontage of 600 feet, extending from low-water mark to an elevation of 55 feet, rise and fall of the river at this point being 52 feet. Further improvements to enable transference of cargo from cars to barges are being planned by the city.

November Ore Shipments

The November ore shipments abruptly changed the relative standing of the 1917 and 1918 movements. On Nov. 1 the 1918 shipments showed an increase of 2,617,273 tons over those of 1917. On Dec. 1 that had shrunk to a decrease of 437,530 tons, and when the final shipments of the season which left upper lake ports early in December were recorded the 1917 lead had become 1,342,169 tons. The change can be laid partly to the fact that the November, 1917, shipments were the largest on record for that month. It is due mostly, however, to the voluntary curtailment of furnace orders which gave right of way to grain and coal shipments. The November, 1917, movement exceeded that of November, 1916, by 1,618,376 tons, while the shipments for November, 1918, are 3,054,803 tons less than those of November, 1917. The three shipments in order of size are as follows: November, 1917, 7,333,828 tons; November, 1916, 5,715,452 tons; November, 1918, 4,279,025 tons.

Total shipments in 1918 were 61,156,732 tons against 62,498,901 tons in 1917, a loss of 1,342,169 tons.

During December, 1917, all of the six upper lake ports shipped ore, making a total of 911,475 tons shipped. During December of this season, Escanaba shipped 6836 tons, and was the only port to send down any ore, making a decrease of 904,639 tons from 1917.

The following table shows the amount of ore shipped from upper lake ports and the total shipments from each port to Dec. 1 and to the end of the season:

	Nov., 1918	To Dec. 1, 1918
Escanaba	715,822	6,768,133
Marquette	206,847	3,457,054
Ashland	631,237	7,565,608
Superior	1,004,140	14,068,341
Duluth	1,285,496	20,567,288
Two Harbors	435,483	8,723,472
Total	4,279,025	61,149,896
1918 decrease	3,054,803	437,530

	December, 1918	Season of 1918
Escanaba	6,836	6,774,969
Marquette .....	.....	3,457,054
Ashland .....	.....	7,565,608
Superior .....	.....	14,068,341
Duluth .....	.....	20,567,288
Two Harbors .....	.....	8,723,472
Total	6,836	61,156,732
1918 decrease	904,639	1,342,169

Soo Canal Report

In November, 8,513,511 net tons of freight passed through the Soo canal, 7,148,364 tons going through the United States canal, while 1,365,147 tons went through on the Canadian side. Combining the figures for the two canals, eastbound freight amounted to 6,355,760 tons as compared to 2,157,751 tons westbound. The grain movement, which has been very small this year when compared to the 1917 shipments, made a decided gain in November when 52,702,409 bushels of wheat passed eastward through the canal. This more

than equals the season's shipments up to Nov. 1, as on that date the season's total shipments amounted only to 47,851,515 bushels. The wheat shipments are still some 67,000,000 bushels behind those of 1917 in spite of this large increase. The iron ore movement slumped during November. In October the shipments totaled 8,428,643 tons, whereas November shipments only amounted to 4,417,282 tons. This greatly reduced the lead which this season had over last. On Nov. 1 this amounted to 3,006,055 tons, but the small November shipments reduced this to 209,279 tons. The fact that furnaces were found to be amply supplied with ore made it possible to cut down the ore shipments and increase those of grain, which, as stated before, have been small.

Total freight passing through the canal up to Dec. 1, 1918, has amounted to 84,677,569 tons as compared with 87,253,760 tons during the same period of time in 1917. Detailed shipments for the two seasons are as follows:

EAST BOUND			
	To Dec. 1, 1917	To Dec. 1, 1918	
Lumber, M. ft. B. M.	348,338	292,418	
Flour, barrels	7,569,259	7,634,524	
Wheat, bushels	187,475,263	100,553,924	
Grain, bushels	60,406,719	27,136,928	
Copper, net tons	116,227	81,320	
Iron ore, net tons	60,121,674	60,330,953	
Pig iron, net tons	10,624	.....	
Stone, net tons .....	.....	16,382	
General merch., net tons ..	251,050	58,642	
Passengers, number	18,858	17,290	

WEST BOUND			
Flour, barrels	90	.....	
Grain, bushels	8,185	.....	
Coal, soft, net tons	15,240,969	15,761,260	
Coal, hard, net tons	2,510,458	2,153,300	
Iron ore, net tons	65,429	141,036	
Manufactured iron and steel, net tons	91,058	37,217	
Salt, net tons	85,493	80,007	
Oil, net tons .....	.....	334,134	
Stone, net tons .....	.....	385,627	
Gen. merch., net tons	1,206,946	417,932	
Passengers, number	18,760	17,698	

SUMMARY			
Vessel passages, number ..	22,305	30,259	
Registered tonnage, net ...	63,724,473	60,496,052	
Freight:			
Eastbound, net tons	68,054,103	65,367,056	
Westbound, net tons	19,199,657	19,310,513	

Total freight, net tons.. 87,253,760 84,677,569

Lake Erie Receipts

Iron ore receipts at Lake Erie ports in November, according to figures compiled by THE MARINE REVIEW, amounted to 4,163,380 tons. This is 891,859 tons below the November, 1917, receipts of 5,055,239 tons. The balance on docks Dec. 1 was 10,376,509 tons, against 10,023,743 on Dec. 1, 1917. Detailed receipts by ports follow:

Port	Gross tons
Buffalo and Port Colborne	879,928
Erie	174,028
Conneaut	579,798
Ashtabula	822,658
Fairport	142,120
Cleveland	782,240
Lorain	292,161
Huron	138,070
Toledo	269,941
Detroit	82,436
Total	4,163,380

Late Decisions in Maritime Law

Legal Tips For Ship Owners and Officers

Specialty Compiled for The Marine Review

By Harry Bowne Skillman

Attorney at Law

A TUG towing a canal boat in a river, the channel in which was dredged, marked and opened by the federal authorities, must keep such boat in the channel, but no liability attaches to the tug where the boat grounds in the channel on a hidden obstruction. The tug has the burden of showing the existence of the obstruction, and therefore of showing that she had the canal boat in the middle of the dredged channel when she grounded, and not outside of it or on its edge.—WESTERLY, 249 *Federal Reporter* 938.

* * *

Where a time charterer of a scow agreed to return the scow in the same condition as received, ordinary wear and tear excepted, and to cover her for the benefit of the owner with insurance against marine perils whenever taken out of a named harbor, which agreement as to the outside trip was waived on the charterer's promise to assume all risks and be responsible for any injury to the scow, the charterer became an insurer, it was held in the case of Dittmar vs. Frederick Starr Contracting Co., 249 *Federal Reporter* 437, and such charterer was liable for injury to the vessel, relief to the charterer from payment of usual insurance premiums and waiver by the owner of his right to insurance being sufficient consideration for the promise.

* * *

The building of a vessel, before it is launched, it was said in the case of SCHUYLKILL, 249 *Federal Reporter* 781, is not a maritime contract, as it takes place entirely on land, and as the object upon which the work is done has not yet reached the point where it is within so-called admiralty jurisdiction. However, the repair of a vessel to make her seaworthy, and for the purpose of obtaining a new registry, where not equivalent to the building of a new vessel, constitutes a maritime contract, and gives a lien.

* * *

The authority of a master to contract for both inward and outward towage was in issue in the case of HOLTHE, reported in 249 *Federal Reporter* 783. After stating that towage service is described "as the employment of one vessel to expedite the voyage of another, irrespective of any circumstances of peril, and when nothing more is required than accelerating her progress, and is confined to vessels that have received no injury or damage," it was held that where the towage service for the purpose of assisting the voyage of a vessel was as much in need of outward towage as of towage into port, a contract of

the master for both inward and outward towage was not invalid, as being beyond his inherent authority, and where the master wilfully repudiated his contract as to the outward towage, although the owner of the tug stood ready and willing to perform such service, the vessel was liable *in rem*.

* * *

According to the case of West India Steamship Co. vs. Chicago House Wrecking Co., 249 *Federal Reporter* 338, a contract of affreightment, if orally agreed upon, would be enforceable, notwithstanding it had not been put into writing as contemplated. In this case the court held that the minds of the parties had met, a comparison of the forms prepared by the parties showing no substantial difference whatever, but that neither party had the right to introduce new provisions in the contract.

* * *

Under a bill of lading providing that the steamship owner shall not be liable for any claim, however arising, of which notice is not given before removal of the goods and amount and particulars of claim given within eight days after receipt of goods, the court held in the case of SAN GUGLIELMO, 249 *Federal Reporter* 588, it was not sufficient that the attention of the captain in one case, and of persons on the wharf directing or supervising the discharge of cargo in the other, was called to the fact that goods were damaged. If this were proof of making claim, then, said the court, "Loose talk of truckmen would be enough to defeat the exception."

* * *

In the case of C. R. SHEFFER, 249 *Federal Reporter* 600, it was decided that "any vessel expected to lie aground must be reasonably fit for the contingencies of such an occupation; but it does not follow that she must therefore be strong enough to hold up a heavy cargo when an extraordinary January gale sweeps out at least 2 feet of water from accustomed mooring places, or that owners are bound to anticipate that in bottoms reasonably level and soft there may not be embedded hard objects that will puncture vessels resting against them."

* * *

The facts in the case of Essex Steamship Co., Ltd., vs. Langbein, 250 *Federal Reporter* 98, show that by the terms of a charter party the charterer of a British vessel was given the privilege of naming either one of three European ports for discharging, and that he in good faith selected and advertised the port of Hamburg as the destination. Subsequently war was declared between Great Britain and Germany, and shortly there-

after British ships were by proclamation prohibited from trading with enemy ports, and from carrying contraband and articles declared by the proclamation to be conditional contraband, until the master had satisfied himself that they had not an ultimate enemy destination. The master declined to take his ship to Hamburg, and the charterer then declared the charter party cancelled. The question for decision was whether the onset of war discharged the parties to the charter party from its performance. "If the charterer had the right to select Hamburg as the port of discharge," said the court, "it is manifest that the charter party was cancelled by operation of law by the declaration of war. That the shipowner could not have been required to take his vessel to the enemy port, in violation of the law of his country and with the certainty that it would be seized by the enemy upon arrival there unless war had then ceased, has been determined * * *. If the owner was released by the state of war from performance of his part of the charter party, it follows that the charterer was released from the obligation resting on him. The release must be mutual, and not optional with the owner alone."

* * *

The Dingley act of June 26, 1884, as amended by the LaFollette act of March 4, 1915, makes it unlawful to pay any seaman wages in advance of the time when he has actually earned the same, and further provides that payment of advance wages shall in no case absolve the vessel from full payment after wages shall have been earned and shall be no defense to a libel for recovery of wages. This act, it was decided in the case of WINDRUSH, 250 *Federal Reporter* 180, has no application to the employment of seamen by American vessels in foreign ports, the court citing the case of STATE OF MAINE, 22 *Federal Reporter* 734. It was further held that where a master could not obtain seamen in the port of Buenos Aires, except by according to the custom of the port of paying a month's wages in advance, which was not unlawful in such port, and paid the wages for a month in advance, the seamen could not recover full wages, without deduction of such payment, at the end of the voyage.

* * *

Failure of salvors to exercise reasonable care to protect property saved must diminish the recovery, for salvage is not only an award, but a reward for successful well-doing. Awards, with respect to harbor salvage, where assistance is abundant and available, should be moderate.—GEORGE W. ELZEY, 250 *Federal Reporter* 602.

Turbine Engines for Cargo Vessels

Recent Improvements in Rotary Type of Propulsion Machinery Have Followed the Interest Newly Aroused in Quickly Fitting Out a Merchant Fleet

ONE result of the shipping board's effort to equip a fleet in the shortest possible time has been the active interest stimulated in the development of propelling machinery. The construction of marine propulsion equipment has become a more important factor in the country's industrial life and refinements of processes and methods are being made.

Turbine engines have been given careful consideration. Two of the first vessels to attain widespread attention as equipped with turbine engines were the **HARVARD** and **YALE**. These vessels were built at Chester, Pa., in 1906 for passenger service between New York and Boston. They are sister ships of 3737 gross tons, 376 feet overall length and are equipped with twin screws, each screw being driven by a 5000-horsepower engine.

One of the first American engineers to devote exhaustive study to the turbine for ship propulsion and other purposes was the late George Westinghouse, as far back as 1909. As a result of his investigations the Westinghouse Machine Co. some years ago became one of the pioneer turbine engine and reduction gear builders of this country.

The company's first contract was for the propelling equipment of two oil tank ships. These were ordinary 10-knot, single-screw vessels requiring 2500-horsepower. The propeller speed was 70 revolutions per minute. As the power and speed conditions of these vessels were generally suitable for a number of freight and tank steamers, a standard design of both turbine and reduction gear was made.

The first set of this machinery was installed in the Norwegian tanker **MALMANGER**. This vessel was sunk by a mine on her maiden voyage. She went down off the Irish coast on March 22, 1917. Her sister ship the Nor-

wegian vessel **GOLAA**, was fitted with the next set of standard machinery to be completed by the Westinghouse company. This vessel is still afloat and has made several round trips between the United States and Europe and at the present time is engaged in coastwise trade. She is 401 feet long, 54 feet beam, 32 feet deep, with a draft of 25 feet 9 inches, and a displacement of 12,650 tons. She has a cargo capacity of 9,000 tons and is designed for a normal speed of 10.75 knots per hour and for a maximum of 11.5 knots. There are six main tanks for oil and four wing tanks. The main tanks are cylindrical and between them and the ship's sides are formed winged tanks. The propelling machinery is located in the stern, and consists of three single-end Scotch boilers and geared turbines for driving the single propeller. The boilers are equipped with forced draft and have a heating surface of 8,860 square feet.

Geared Turbine Drive

The propelling machinery, which was furnished by the Westinghouse Machine Co., East Pittsburgh, Pa., is of the geared turbine type. The unit is composed of a high and a low pressure turbine of the impulse reaction compound type, two single pinion first reduction gears, and one double pinion second reduction gear. At full power, the turbines are designed to develop 1,250 horsepower each or a total of 2,500 horsepower, at a speed of 3,600 revolutions per minute.

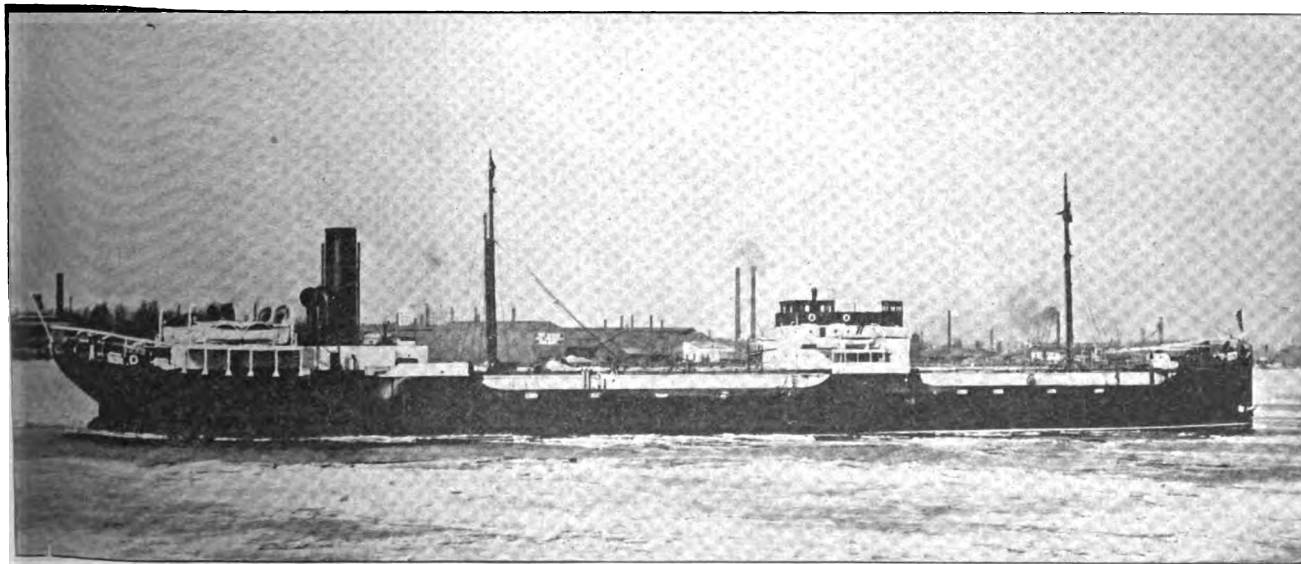
The ahead high pressure turbine is composed of a two-row impulse wheel followed by reaction blading on a drum. The ahead low pressure turbine is of the reaction type. The astern high pressure and low pressure turbines are two-

row impulse wheels. In both ahead and astern turbines the steam passes successively through the high and low pressure turbines. The admission of steam to the ahead and astern turbines is controlled by two balanced throttle valves, both of which are contained in one body and are operated by the same hand wheel. The piping and valves are arranged so that in addition to the normal cross compound operation, either the high pressure or the low pressure ahead or astern turbines can be operated independently in case of emergency, the turbines being controlled by the main throttle valve in all cases.

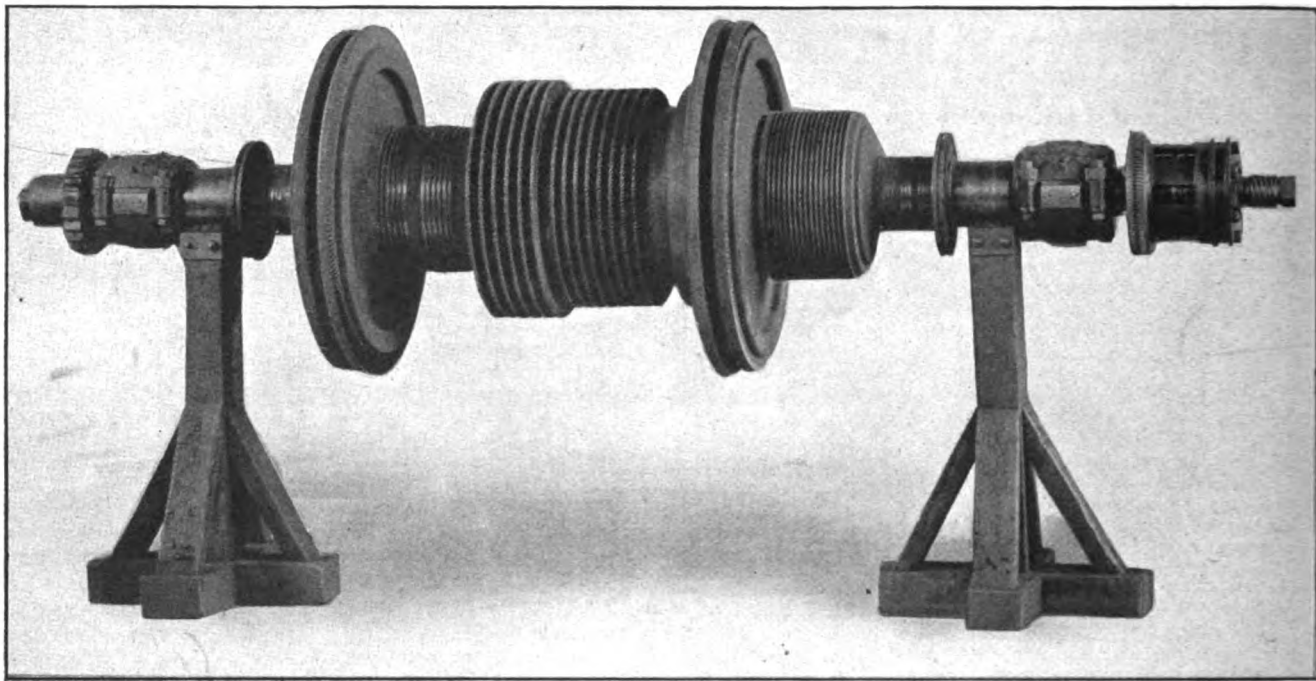
The astern turbines will develop 60 per cent of the ahead power with the same flow of steam. Steam is supplied to the turbines at a pressure of 180 pounds gage, and the condensing plant is designed to maintain a vacuum of 28.5 inches of mercury.

The turbine cylinders are cast iron, except the ahead end of the high pressure turbine which is cast steel, and are divided on the horizontal plane. The main bearing pedestals at the exhaust ends are cast integral with the lower halves, but at the inlets the main and thrust bearing pedestals, which carry the governors, are cast separately and bolted on. The ahead high pressure nozzle chamber is contained in the end of the cylinder casting, which is made of cast steel in order to withstand high pressure and temperature. The astern high pressure nozzle chamber is a separate steel casting bolted inside of the cylinders. The astern low pressure nozzle chamber is of the same construction, but is of cast iron. The ahead low pressure inlet chamber is formed in the cylinder.

The shafts and rotors are forged



NORWEGIAN TANKER GOLAA READY FOR SEA.—THIS VESSEL IS POWERED WITH TURBINE ENGINES



IMPULSE REACTION TURBINE SPINDLE

steel. The impulse wheels are formed integral with the shafts and the parts of the rotors bolted together on a large diameter. The length between bearings is short and the construction exceedingly stiff, thus obtaining smooth and safe operation. The high pressure ahead and astern and the low pressure astern nozzles are of the divergent type. They are cast in bronze and secured to the nozzle chambers. The upper high pressure ahead nozzle chamber is divided into three compartments, two of which are provided with hand-operated valves for closing off part of the nozzles at reduced power, for group control. With such an arrangement all,

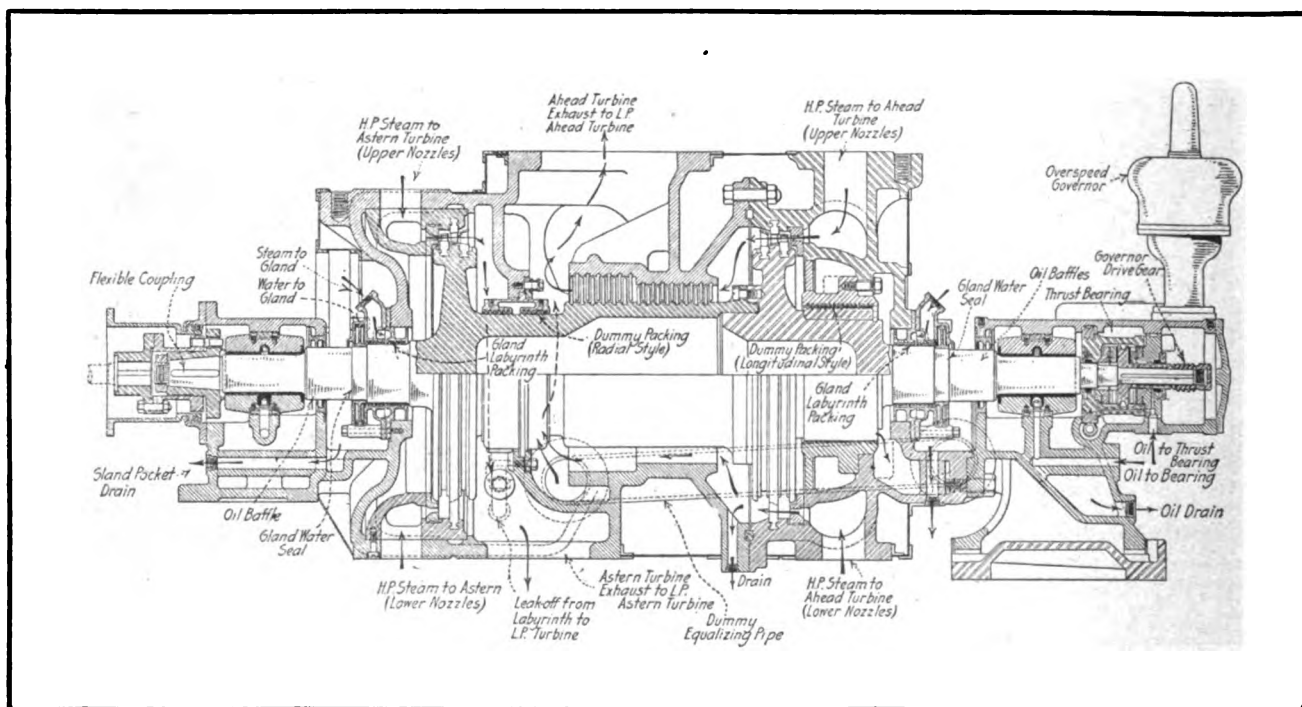
five-sixths, or three-fourths of the nozzles may be in operation as required. The astern nozzles are not arranged for group control for the reason that economy at reduced astern power is of little importance.

The impulse blades are machined nickel steel and are secured in the rotor by a tongue and groove construction. They are additionally secured against vibration by being tightly wedged in the groove. The tips of the blades are secured by a binding strip which is inserted in a groove and welded, making an unusually strong and rigid construction.

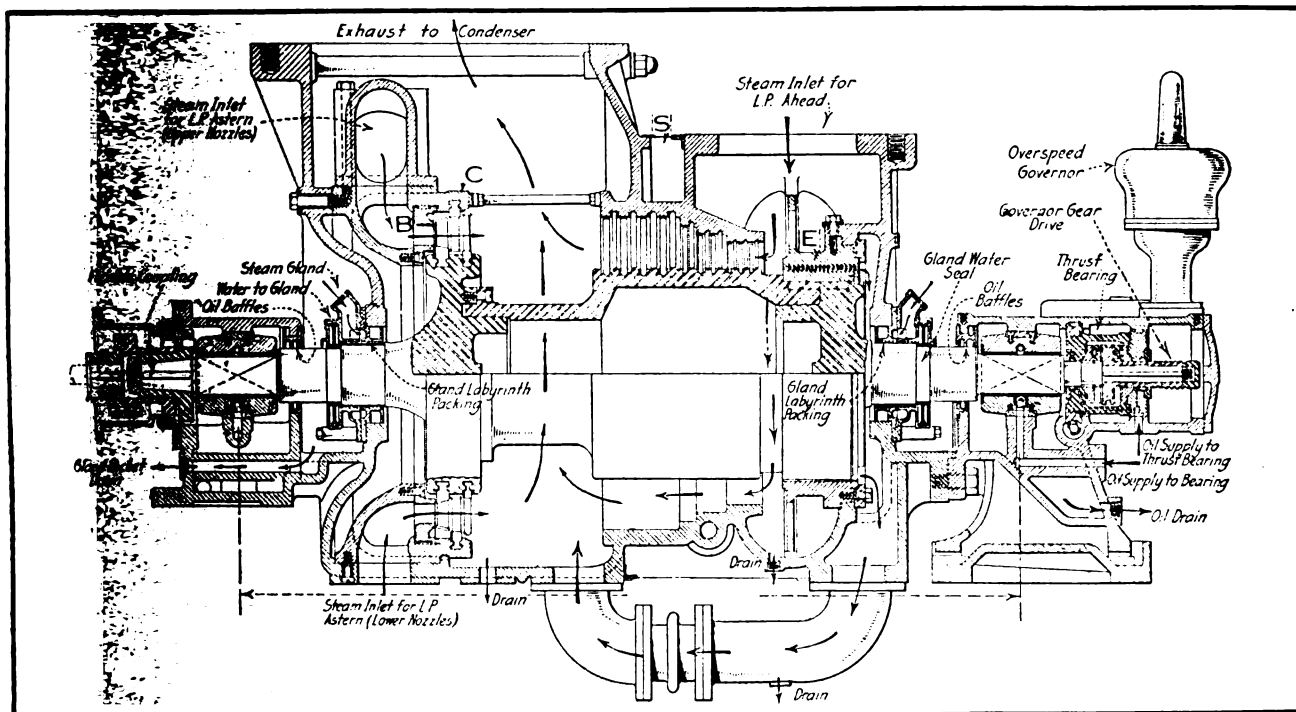
The reaction blading is made from

drawn phosphor bronze. The foot on the end of the blade fits under the packing piece, forming a positive interlock which holds the blade securely. The blade groove is undercut and is provided with a groove in the floor of the main groove for the reception of the feet of the blades. The blades are secured at their outer radius by a comma lashing wire passed through them near the ends, clinched, and silver soldered. The blade section is tapered, being thicker at the root than at the tip, for the purpose of equalizing stresses.

The reduction gears are of the West-



HIGH PRESSURE TURBINE



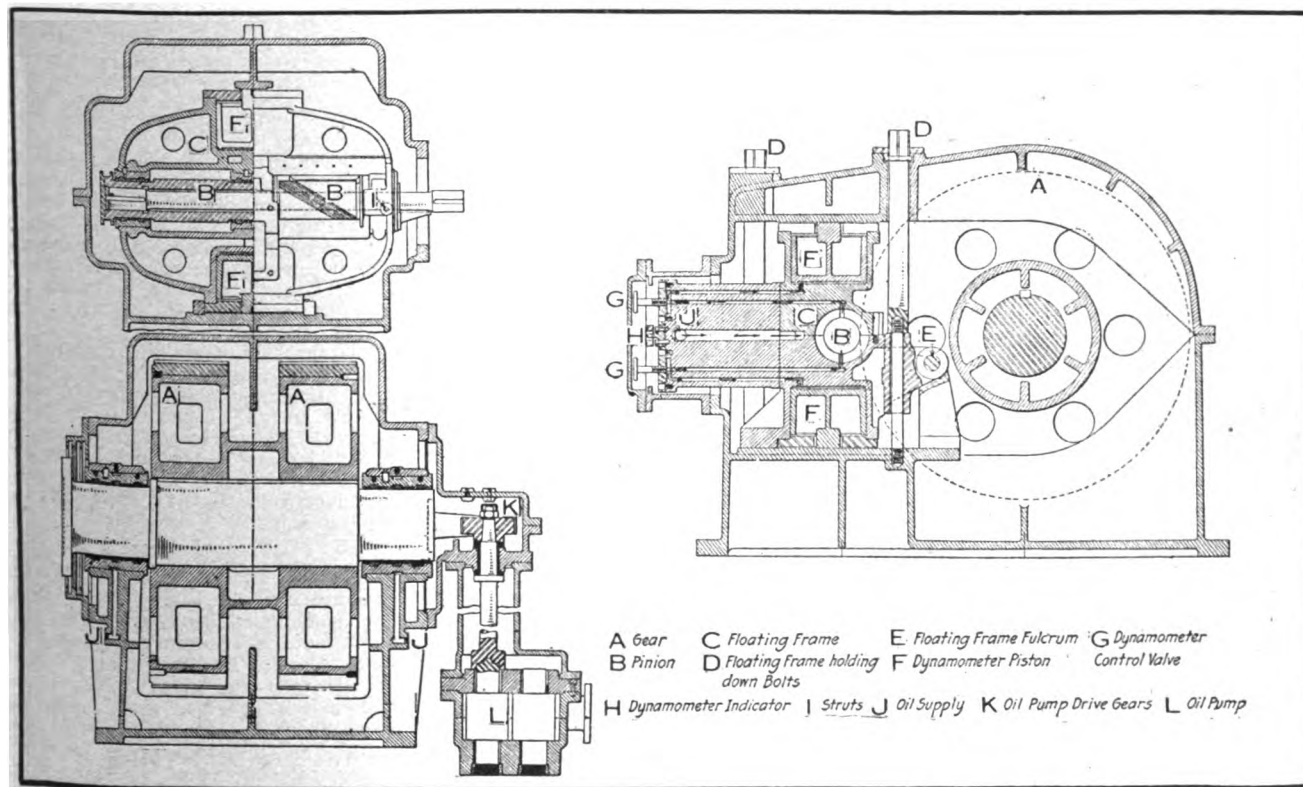
LOW PRESSURE TURBINE

inghouse double helical floating frame type. They are completely enclosed in an oil-tight cast iron gear box, divided on a horizontal plane. The teeth are inclined at an angle of 30 degrees and are of involute form. At designed full power the first or high-speed gears reduce the speed from 3600 to 450 revolutions per minute, and transmit 1,250 horsepower each. The second or low-speed gears reduce the speed from 450 to 70 revolutions per minute, and trans-

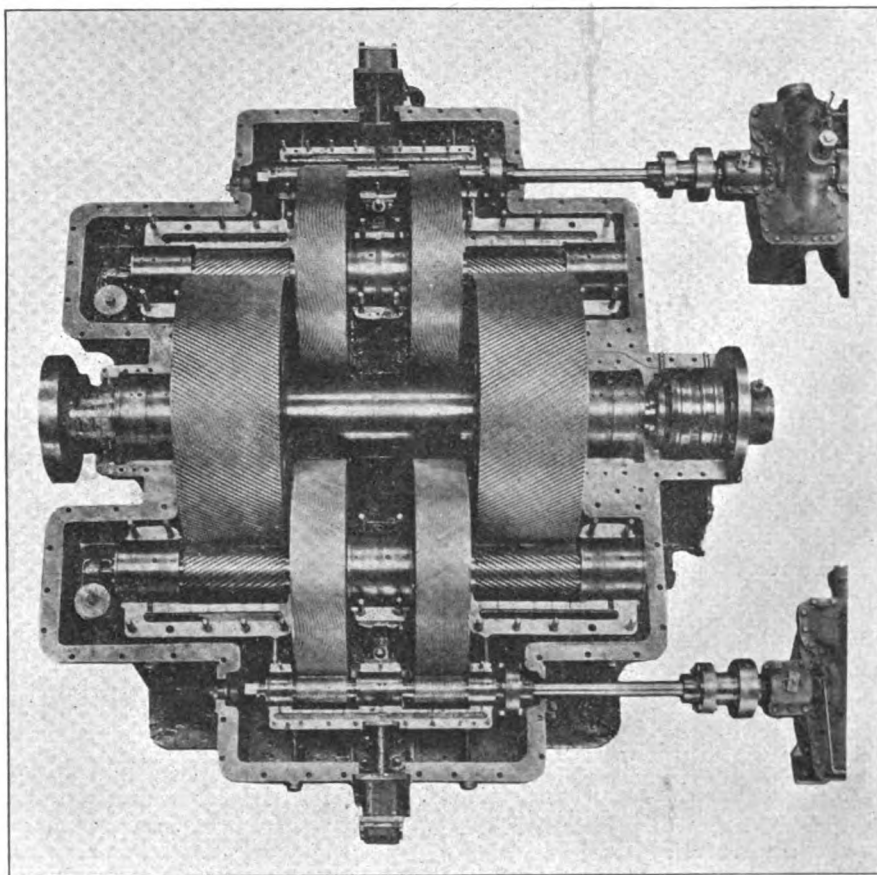
mit 1,250 horsepower per pinion, making a total for all gears of 2,500 horsepower. The total speed reduction from the turbine speed of 3,600 to the propeller speed of 70, gives a ratio of 51.4 to 1.

The pinion is of the three-bearing type and is carried in a heavy floating frame, which automatically maintains the alignment of the pinion and gear under all conditions of load, producing uniform distribution of the pressure

over the entire length of the tooth face. The pinion is driven by a flexible shaft extending through it, and is secured to the end distant from the coupling. The floating frames are of extremely rigid construction to avoid deflection, and are supported by feet under the middle bearing. The gear wheels are composed of a heavy forged steel shaft, a cast iron center, and forged steel rims. The gear and pinion bearings are composed of heavy cast iron bodies lined with



FIRST REDUCTION GEAR



DOUBLE REDUCTION GEAR WITH COVER REMOVED TO SHOW MECHANISM

white metal, bored and reamed to size.

The main bearings are of the self-aligning type and are provided with pads and liners, by means of which the rotor can be adjusted vertically and horizontally. A Kingsbury thrust bearing of the segmental type is contained in the forward end of the second gear and is provided with means for moving the rotor endwise for adjusting the dummy clearances. An emergency overspeed governor is located forward of the thrust bearing and is driven from the turbine shaft by spiral gears at 24 per cent of the speed of the turbine, or at 857 revolutions per minute for the full speed. The lifting gear is composed of I-beam girders and chain hoists above the turbines and gears, and special slings and guides are provided for lifting the rotors without injury to the blading. A hand ratchet lever is provided for turning the turbine.

Westinghouse hydraulic dynamometers are incorporated in the pinion frames of the first gear for measuring the power transmitted. The dynamometer is composed of two pistons, one above and one below, which seat on the gear box and operate in cylinders in the floating frame.

The condensing plant is of the latest Westinghouse type for producing the high vacuum required by turbines. The condenser is of the steel plate type with cast iron heads, and is arranged for three passes of the cooling water. The tubes are $\frac{5}{8}$ -inch outside diameter and

8 feet 6 inches long between the tube plates. The cooling surface is 4,500 square feet. With 65 degree cooling water, the condenser is designed to produce a vacuum of 28.5 inches of mercury referred to a 30-inch barometer.

The circulating pump is of the single-runner slow speed type, designed for high efficiency, and is driven by a geared turbine unit. The revolutions of the pump are 550, that of the turbine being 6,600. This gives a high efficiency for both pump and turbine, resulting in a very economical unit. The pump has a capacity of 2,900 gallons per minute and requires 20 horsepower. When operating with 150 pounds of steam and 5 pounds back pressure, the estimated steam consumption is 1,100 pounds per hour.

There are two condensate or hot well pumps for withdrawing the condensate from the condenser. One pump is ample to serve the condenser up to maximum power; the second is provided as a spare for emergency use.

The lubrication of the main turbine bearings, the gear teeth, and bearings, is effected by a continuous circulation of oil through a gravity system composed of delivery and return piping, pumps, cooler, strainer, and tank. Oil is supplied to the gears and turbine under a pressure of about 5 pounds. The oil first passes through a cooler and is then supplied to the bearings and gear teeth, after which it is drained back into the second gear box from

which it passes into the drain tank. From the drain tank it passes into the oil pumps. These discharge it back into the gravity tank through strainers located in the top of the tank.

Westinghouse-LeBlanc air ejectors are provided for withdrawing air from the condenser. There are two ejectors, one being sufficient for full load requirements, the other provided as a spare. The estimated steam consumption is 1,760 pounds per hour for the two ejectors. Each weighs 97 pounds. The air is withdrawn by multiple jets of steam in series which compress it to atmospheric pressure. The mixture of air and steam passes into the air ejector tank where the steam is condensed and the air escapes to the atmosphere.

All the machinery in this installation with the exception of air ejectors and auxiliary oil pumps, is of the rotary type.

The vessels for which the Westinghouse company has furnished turbines and reduction gears include the following, of which the MALMANGER and WESTERLY were sunk:

Name	Where Built	Type	Horsepower
MALMANGER	Chester, Pa.	Oil Tanker	2900
GOLAA	Chester, Pa.	Oil Tanker	2900
HISKO	Chester, Pa.	Oil Tanker	2900
AVONDALE	Chester, Pa.	Oil Tanker	2900
SUDBURY	Chester, Pa.	Freighter	2300
OVERBROOK	Chester, Pa.	Oil Tanker	2900
CORONADO	Oakland, Cal.	Freighter	2400
YOSSEMITE	Oakland, Cal.	Freighter	2400
YELLOWSTONE	Oakland, Cal.	Freighter	2400
OAKLAND	Oakland, Cal.	Freighter	2900
WESTERLY	Seattle	Freighter	2500
WESTWOOD	Seattle	Freighter	2500
WEST EAGLE	Seattle	Freighter	2500
MAUI	San Francisco	Freighter	2500
WEST FORD	Seattle	Freighter	2750
ACCOMAC	Los Angeles, Cal.	Freighter	3000
POLAR SEA	Baltimore, Md.	Freighter	1800
WAKULA	Los Angeles, Cal.	Freighter	3000
MONTROLITE	Seattle	Tanker	2500
WAMPUM	Los Angeles, Cal.	Freighter	3000
WASSIAC	Los Angeles, Cal.	Freighter	3000
WEST GALOC	Los Angeles, Cal.	Freighter	3000
PHOENIX	Chester, Pa.	Tanker	2900

The Port Arthur Shipbuilding Co., Ltd., Port Arthur, Ont., recently launched the VICTORIE, a steel ocean going tug built to Lloyd's classification. The vessel develops 800 horsepower and her general dimensions are as follows: Length between perpendiculars, 119 feet; molded beam, 26 feet; molded depth, 26 $\frac{1}{2}$ feet.

The propelling machinery consists of a triple expansion engine of the surface condensing type having three cylinders 15, 29 and 47 inches bore x 36-inch stroke. Steam is generated by two Scotch boilers 11 feet in diameter x 11 feet long. The boilers are allowed a working pressure of 180 pounds per square inch.

What is said to be the world's first concrete canal barge was recently launched from the Fort Edward shipyards on the Hudson river near Glens Falls, N. Y. The craft has a capacity of 500 tons and cost \$35,000. It was built and launched in seven weeks. The yards have a contract for seven more barges on the same type in various stages of completion. All the barges are being built under government contracts.

Marine News in a Personal Way

Intimate Gossip About What Leaders in the
Maritime World Are Doing

L. F. BODY has joined the sales organization of the Glidden Co., Cleveland, as manager of marine, street railway and railway sales. Mr. Body has been connected with the paint and varnish business for many years. He was first identified with the Sherwin-Williams Co. in 1902 where he was successively promoted until he became manager of railway and marine sales in 1912. In 1915 Mr. Body severed his connection with the Sherwin-Williams Co. to become sales manager of the Master Builders Co., Cleveland, which position he leaves to enter upon his new duties.

CAPT. I. N. HIBBERD, in charge of the San Francisco division of the shipping board sea training bureau since last March when the organization was first installed there, has been promoted to general supervisor of the division with headquarters in Boston. Captain Hibberd is now in charge of the training of recruits from all parts of the United States, including training ships at Boston, Norfolk, New Orleans, San Francisco and Seattle.

WILLIAM J. MURRAY, port superintendent for the United States shipping board at San Francisco until the discontinuance of the physical operation of ships by the government, has opened an office in the Alaska Commercial building in the western city as a marine surveyor. This is to meet the greater demand at San Francisco for marine surveyors with the large increase in the number of vessels. Mr. Murray was for 28 years with the New York firm of J. F. Chapman & Co. Later, as port superintendent for the American-Hawaiian Steamship Co. at San Francisco, he had charge of the docking, loading, discharging and upkeep of the company's fleet.

L. C. SPRAGUE has been appointed assistant secretary of the Chicago Pneumatic Tool Co., with headquarters at 52 Vanderbilt avenue, New York City.

I. H. MILLS, who has been associated with the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for the past 23 years, has resigned to become superintendent of the Sperry Gyroscope Co., Brooklyn, N. Y. Mr. Mills began his career with the Westinghouse as a machine operator, and finally became superintendent of the small industrial motor department.

FRED A. SHARP, Springfield, Mass., has entered the employ of the Terry Steam Turbine Co., Hartford, Conn., as cost manager.

R. M. RUSH recently resigned as assistant district supply manager of the

Emergency Fleet corporation for the Youngstown and Pittsburgh districts. Mr. Rush has resumed his former duties as district manager of the Kerr Turbine Co., and president of the Rush Machinery Co., Pittsburgh.

CAPT. F. H. DEMPE and **CAPT. GEORGE H. TOON**, assistant local inspectors of hulls, have been transferred from Norfolk, Va., to Philadelphia and have been assigned to duty in the federal steamboat inspection service.

K. TAKAKUWA has been appointed local manager of Y. Takakuwa & Co.'s San Francisco office. The company is



L. F. BODY

an importer and exporter of eastern goods with its home office in Osaka, Japan.

R. HARRY DOZIER, traffic assistant of the transportation and supply department of the United States shipping board, has resigned to accept a position on the regional staff of the United States railroad administration. Before entering the employ of the shipping board he was connected with the internal revenue department.

A. F. HAINES, general manager of the Pacific Steamship Co., was elected a vice president of the company at the annual meeting of the company held recently in Tacoma, Wash. **H. F. ALEXANDER** was re-elected president; **E. A. STUART** and **CHESTER THORNE**, vice presidents; **WILLIAM JONES**, treasurer and **E. B. ROGERS** secretary and

assistant treasurer. **E. C. WARD** retired as vice president but remained as a member of the board. Mr. Haines in the operating of the company will have the title of vice president and general manager.

R. H. MORSE has been elected vice president in general charge of purchasing and traffic for Fairbanks, Morse & Co., Chicago. Mr. Morse has been with the Fairbanks company for many years and has had a wide experience in both sales and manufacturing departments. He still continues his duties as a director of the company. Other changes in the company's organization elevate **C. W. PANK** from general director of sales to vice president in charge of sales of all factory products; place **W. S. HOVEY** as vice president in charge of general manufacturing at all factories and make **W. E. MILLER** vice president and treasurer instead of first vice president. **F. M. BOUGHEY** leaves the position of treasurer to become secretary and comptroller.

LESTER C. NEFF has accepted a position in the division of operations of the United States shipping board. Mr. Neff until recently was associated with Seth Mann as assistant manager of the traffic bureau of the San Francisco chamber of commerce.

JOHN A. TAIT has been appointed assistant manager of the Philadelphia office of Furness Withy & Co., Ltd. Mr. Tait's connection with the shipping business dates back many years to the days of Charles M. Taylor's Sons. For some time Mr. Tait has been manager of the Philadelphia Ceiling & Stevedore Co., a subsidiary of Furness Withy & Co., Ltd., and in that capacity he had charge of the business of all the company's vessels consigned to that company.

FRANK O'CONNOR has been appointed manager of the Pacific Steamship Co.'s new office recently opened in Vancouver, B. C.

GEORGE W. STERLING has been elected vice president of the Eastern Steamship Lines, Inc., with offices in New York.

CAPT. ROBERT E. TAPLEY who was United States hull inspector for the past 16 years at Norfolk, Va., resigned recently to take command of the shipping board's new steamer **BOLSON** which recently loaded with cotton at Savannah, Ga. Previously to becoming a local inspector, Captain Tapley served as an officer in the New York & Cuba Mail Steamship Co.'s vessels, and also aboard vessels of the Mallory and the Old Dominion lines.

How Men Are Trained at Hog Island

Men Who Previously Knew Nothing of Mechanical Pursuits Are Trained on Practice Ship Sections Until They Can Qualify on Actual Work

By B. K. Price

WHEN the work or fight ruling went into effect last summer, Hog Island was besieged by a vast horde of men endeavoring to get into essential industry. These men, needless to say, came from all walks of life and represented a highly divergent range of occupations. There were traveling salesmen, ribbon-counter clerks, bartenders, billiard champions, etc.—and all would-be shipbuilders. It has been the rapid transformation of the novice to the skilled workmen that the shipping board has had to rely upon greatly in the prosecution of its huge shipbuilding program. In fact, without some such metamorphosis, the production of ships at the present high rate would be impossible. When the present shipping board was organized over a year and a half ago, one of the first and most serious problems confronting it was the building up of a supply of experienced shipbuilders. A careful survey of the situation at that time showed that there were approximately 50,000 in the various yards throughout the country, or one-tenth of the estimated number required. In taking immediate steps to cope with this situation, a school was established at Newport News, Va., for training instructors. Here men experienced in the various shipbuilding crafts were enrolled and taught the quickest and most approved methods of instruction. Upon completing their course they were sent to training schools which in the meantime were being established at a number of the larger yards; and so the present system of training men to build ships was laid.

The school at the Hog Island yard is the largest in the country, and is exemplary of the most modern trade-

school practice. At the present time, it has an enrollment of approximately 1100 apprentices, ranging from 16 to 45 years in age, all of whom are paid during the course of their instruction. These men now are being graduated at the rate of about 200 to 250 a week, and during the summer when the enrollment was the largest, 300 men on an average were being turned over to

The direction of the school is in charge of E. W. Miller, who is assisted by seven supervisors and 75 certified instructors. In addition, there are at least 100 uncertified instructors, all of whom have had not less than five years' experience. With such a large staff it is possible to give the apprentices the individual attention which is so particularly essential in

training the men in the short period of time allowed—a matter of three weeks. Consequently, the classes are small. In fact, none contains more than 15 students and many not more than 10. While courses at the school are scheduled to cover a period of three weeks, this time may be extended in individual cases, where the work of the apprentice fails to gain the approval of the ship construction department. These cases, however, are few. Of the three weeks usually given to instruction, about 10 days are spent in the preliminary training in the school, and the remaining time in actual constructive work on the ways, but under different instructors. An exception to this rule may be found in the course in ship carpentry, which requires that the full three weeks be spent in the

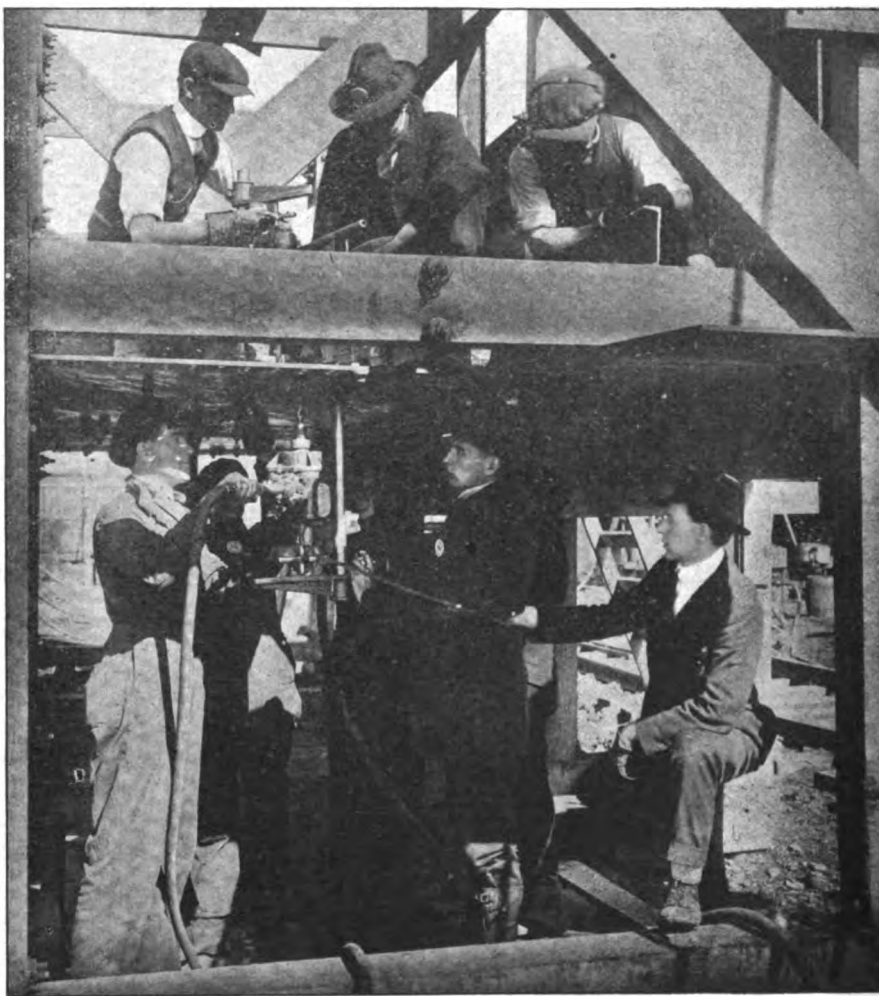


FIG. 1—LEARNING THE MYSTERIES OF THE AIR DRILL AT No. 4 TRAINING SCHOOL

the yard's ship construction department.

The school covers an area of about four acres, being approximately 200 feet wide and 800 feet long. Twelve small buildings have been erected, including executive offices, tool repair shops and supply houses, and, as clearly indicated by the accompanying illustrations, practically all the remaining space in the yard is given over to instruction purposes. Here bulkheads and other ship sections are built up and torn down with a ceaseless regularity by the unending chain of new apprentices, all eager to learn.

school, and also in the course in erecting, in which instruction is given on the ways only.

In applying for training at the school, the applicant must undergo a thorough physical examination. Should he appear to be lacking in strength and endurance, yet at the same time be found physically sound, he is set to work for a while doing light jobs such as picking up rubbish, etc., during which time he accumulates a sunburn and gets lots of fresh air. As soon as he becomes sufficiently hardened, he is accepted for training in

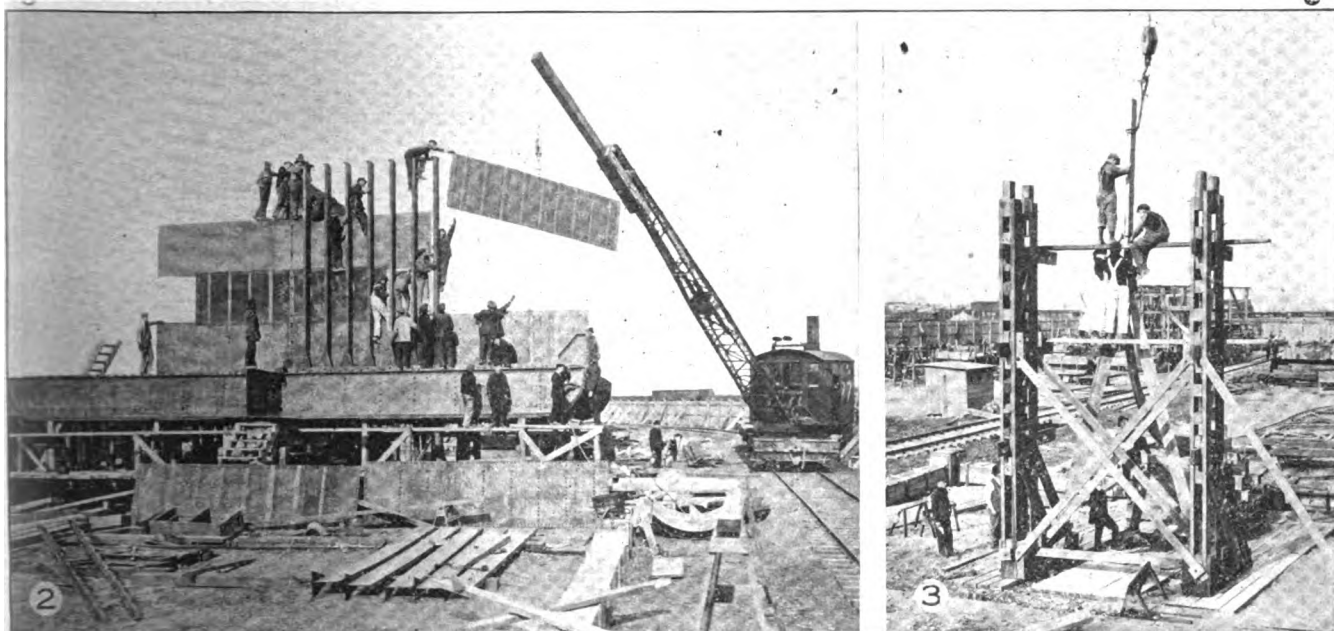


FIG. 2—ERECTING A PRACTICE SHIP AT HOG ISLAND—BY FITTING ACTUAL SHIP SECTIONS THE MEN SOON BECOME EXPERT. FIG. 3—TRAINING MEN TO BECOME SHIP CARPENTERS AT No. 2 TRAINING SCHOOL

the school. Here he is allowed to choose from several of the trades taught. Perhaps, inasmuch as he is not particularly rugged, he will not be allowed to select a trade such as riveting and erecting, for instance, which involves heavy duties. It is found that the average man to do such work efficiently must weigh at least 150 pounds, and, consequently, this rule for the most part is strictly observed. There is, however, other work such as chipping, caulking, drilling and reaming, from which the man can make his choice. If, after a few days, the man believes he had made the wrong selection, he is allowed to change to some other line of work.

For the course in ship carpentry, the applicant, in addition to passing the physical test, must qualify as an experienced house carpenter. Not infrequently, a man with such experience, considers himself capable of starting on actual constructive work

immediately. This, however, he finds is impossible for he first must familiarize himself with new terms and certain principles peculiar to shipbuilding, and also learn the use of several new tools.

Must Learn New Methods

Much the same experience is had by the structural riveter who applies for work on the ways. He, too, finds he must first revamp his trade knowledge to meet the requirements of shipbuilding. For instance, in hull construction, the rivets must be driven flush with the plates; there can be no rounded ends, and, consequently, a different tool must be used. Furthermore, the rivets must be driven countersunk and watertight, something which is not requisite of a structural job.

Perhaps the latest course to be taken up at the school is that in electric welding. In selecting men for this course, considerable care is

exercised, for, due to the particular nature of the work, the men must be thoroughly conscientious and trustworthy. Apprentices after graduating are set to work welding stanchions, deck fittings and various other jobs sanctioned by the classification society. At the present time there are about 12 machines installed in the school.

It is expected that another course will be added soon. This will be for the instruction of men as installation machinists, and also another for the training of engineers and their assistants.

As a testimonial to the excellent work being accomplished, inspectors at the Hog Island yard report that of the total number of rivets driven in the ships up to the present time, less than 1 per cent have been found unsatisfactory. Four of the hulls have not had a single rivet driven in them except by graduates of the Hog Island school.

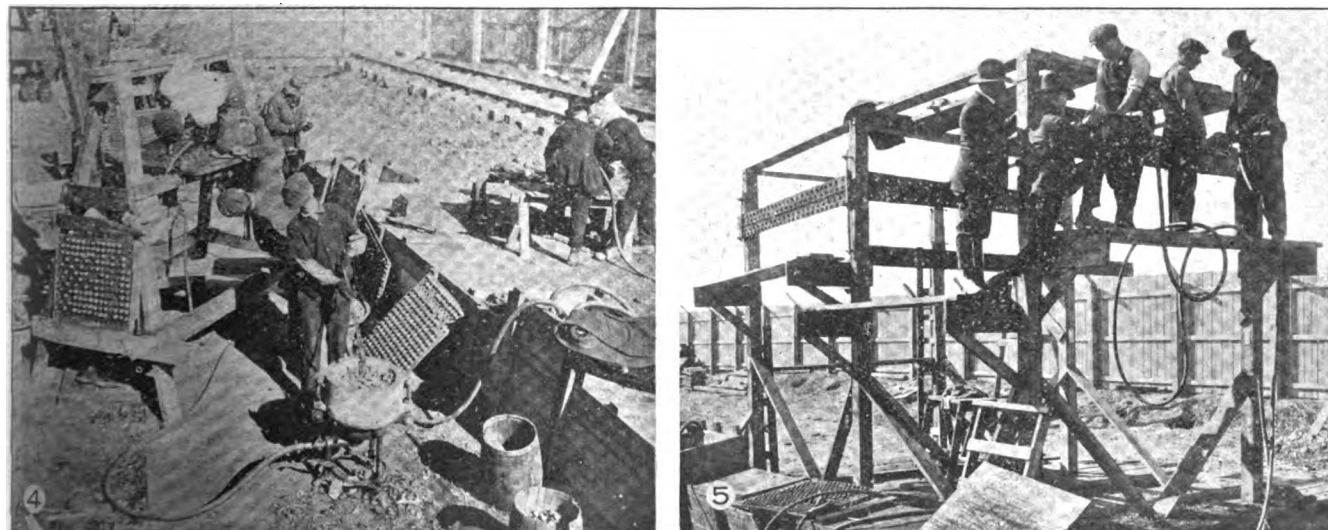


FIG. 4—THE WAY TO LEARN TO DRIVE RIVETS IS TO DRIVE THEM—THESE STUDENTS ARE KEPT AT IT UNTIL THEY CAN TURN OUT CREDITABLE WORK. FIG. 5—DRILLING AND REAMING PRACTICE AT No. 3 SCHOOL

American Ship Yard Activities

A Snappy Summary of the Leading Events of the Month in the Vessel Construction Field

Contract Cancellations Stir Wood Yards

By R. C. Hill

WHOLESALE cancellations of contracts for wooden ships have featured the shipbuilding situation in the Pacific Northwest recently. The shipping board has announced as its general policy, since the signing of the armistice, that all contracts for wooden vessels, on which work has not been started, would be withdrawn. This has upset the plans of the wood yards in Washington and Oregon. These plants in consequence are either seeking private contracts or are preparing to close.

The Foundation Co., which held extensive contracts at both its Tacoma, Wash., and Portland, Oreg., yards, this month finished its contract for the French government with the launching of the twentieth auxiliary wooden steam vessel from each of the Tacoma and Portland plants. By Jan. 1, it is expected that an announcement will be made as to the future of these two yards. It is semi-officially stated that they will continue but the details of future work are not yet available.

Cancellations at Seattle yards include: Four contracts held by the Patterson-McDonald yards, one by the Allen Shipbuilding Co. and two by the Puget Sound Bridge & Dredging Co. Other contracts withdrawn at Oregon and California yards include two for steamers and seven for tugs, as follows: Two at St. Helens, Oreg., yards; two at Kruse & Banks, Marshfield, Oreg.; two at Benicia, Cal.; two at Rolph yards, Eureka, Cal., and three at Fulton yards, Los Angeles, Cal.

While the wood shipbuilders realize the government's position, on the sudden ending of the war, there is considerable feeling in the state of Washington with reference to the restrictions which have been placed upon the taking of private contracts. For months, foreign interests have been endeavoring to place contracts for wooden ships but Washington and Oregon yards have been unable to take this private business as all their ways were reserved for the government. However, the foreign owners have gone to British Columbia where many of the yards are filled with private contracts. On the American side, the builders find themselves with government contracts cancelled and their British competitors busy with private contracts. It is believed that considerable business will come to Washington and Oregon yards but in the meantime these builders are considerably worried about the outcome.

The launching record for November is creditable to the Pacific Northwest district, including 11 wooden and 6 steel hulls. The Skinner & Eddy Corp. sent into the water during the month three steel hulls, one of 8800 tons and the other two of the new 9600-ton type. The EDGEcombe, one of the latter, was launched in 51 working days which is believed to be a record for a hull of this size. On ways No. 4, from which the EDGEcombe was sent down, this plant has constructed and launched five steel hulls of a deadweight capacity of 44,800 tons since Jan. 1, 1918. The EDGEcombe is the thirty-eighth hull launched at this plant since Sept. 22, 1916.

The Seattle-North Pacific yard maintained its monthly record by launching the 9400-ton steel hull ICONIUM, the third of that type in as many months. The Columbia River plants, both steel and wood, continued their fast pace. November saw the first launching at the J. H. Price yards, Seattle, the 2400-ton SNETIND. This yard was formerly the Sandstrom plant but it went into bankruptcy and work was suspended for several months.

The vessels launched during November at Oregon and Washington yards include the following:

Nov. 2—BONNATURE, 8500-ton wooden steamer by Pacific American Fisheries Co., Bellingham, Wash.

Nov. 6—FORT RUSSELL, 3500-ton wooden steamer by Seaborn Shipyards, Tacoma, Wash.

Nov. 7—BLAKELEY, 4000-ton wooden steamer by Puget Sound Bridge & Dredging Co., Seattle.

Nov. 9—WESTERN ALLY, 8800-ton steel steamer by Ames Shipbuilding & Drydock Co., Seattle.

Nov. 9—CORVALLIS, 4000-ton wooden steamer by Peninsula Shipbuilding Corp., Portland, Oreg.

Nov. 9—WEST WAUNA, 8800-ton steel steamer by Northwest Steel Co., Portland, Oreg.

Nov. 9—FORT SILL, 3500-ton wooden steamer by Grant Smith-Porter Ship Co., Portland, Oreg.

Nov. 17—SNETIND, 2400-ton wooden steamer by J. H. Price Shipbuilding Co., Seattle.

Nov. 17—GRAYLING, 4000-ton wooden steamer by Grays Harbor Shipbuilding Co., Aberdeen, Wash.

Nov. 22—GIVENCHY, 3000-ton auxiliary wood steam schooner, by Foundation Co., Tacoma, Wash.

Nov. 23—BUSHONG, 3500-ton wooden steamer, by G. M. Standifer Construction Corp., Vancouver, B. C.

Nov. 26—ICONIUM, 9400-ton steel steamer, by Seattle-North Pacific Shipbuilding Co., Seattle.

Nov. 26—BENOWA, 4800-ton wood steamer, by Patterson-McDonald Co., Seattle.

Nov. 23—EDGEcombe, 9600-ton steel steamer, by Skinner & Eddy Corp., Seattle.

Nov. 27—SOISSONS, 3000-ton auxiliary wood steamer by Foundation Co., Portland, Oreg.

Nov. 9—EDENTOWN, 9600-ton steel steamer by Skinner & Eddy Corp., Seattle.

Nov. 14—WEST CRESSY, 8800-ton steel steamer by Skinner & Eddy Corp., Seattle.

Canada Extends Ship Program

Contracts have recently been placed with several leading shipyards in Canada for the construction of 31 steel ships, ranging in deadweight tonnage from 3400 to 8100, according to C. C. Ballantyne, Canadian minister of marine and fisheries. In addition to the types of vessels for which contracts have been placed, plans and specifications for a larger type of 10,500 tons are in course of preparation, and it is stated that contracts for several vessels of this type will be placed in the near future at Halifax, N. S., Vancouver and Victoria, B. C.

All the vessels to be constructed under the Canadian government shipbuilding program will be built of steel, some of the 1-deck type and some of 2-decks, suitable for bulk and general cargo. The sea speed of the ship will vary from 9 to 12 knots. All vessels will be built to Lloyd's or British corporation highest class, under the requirements of the British board of trade and the Canadian steamship inspection board.

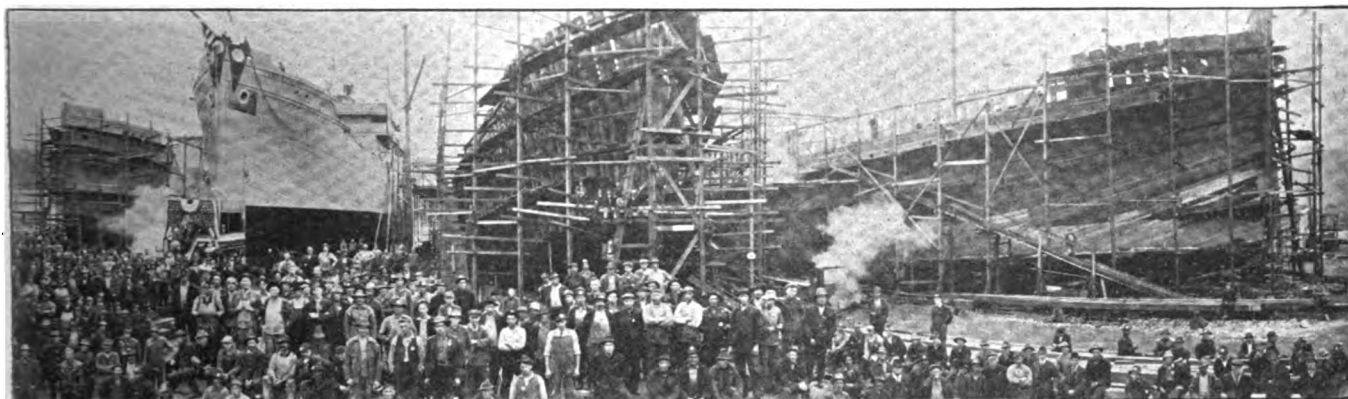
The first launching under the program took place from the yards of the Canadian Vickers, Ltd., Montreal, Que., toward the latter part of November, when two vessels—one of 4300 tons and another of 8100 tons—took the water. The work was expedited to enable the vessels to proceed on their first voyage before navigation closed on the St. Lawrence. The keel of the first vessel of 4300 tons was laid March 31, last; while that of the 8100-ton ship was laid on July 13.

Mr. Ballantyne states that unless delays in the delivery of steel occur, seven or eight vessels will be ready for commission at the opening of navigation next spring, and that he fully expects to have the 31 ships, aggregating 175,000 tons, in commission before the end of 1919. The delay in laying keels and completing ships is due to the fact that all the ways were occupied with the construction of ships for the imperial munitions board. As rapidly as ships, under construction for the board, are completed, the berths are immediately occupied with the construction of ships building under the government program.

While the price being paid for these vessels is substantially higher than the price paid in Great Britain, Mr. Ballantyne pointed out that the vessels were being constructed at prices that compare favorably with those being paid for similar types in United States yards. Mr. Ballantyne states that plates and

shapes which are at present obtainable only in the United States, are being purchased for the same price as being paid by the United States government, and although substantially lower than prices prevailing in the open market, are materially higher than prices heretofore ruling in Great Britain. As the result

of the difficulties experienced in securing supplies of plates, Mr. Ballantyne stated that he had become more convinced of the soundness of the policy adopted by the Dominion government of providing for the manufacture of ship plates in Canada. Several steel mills probably will be equipped for this purpose.



Panoramic view taken at the Grant Smith-Porter Ship Co., Aberdeen, Wash. The picture was taken prior to the launching of the Fort Seward, the tenth vessel to be launched for the shipping board by the company. The progress of the construction of the four hulls shows how the work is divided to insure best results.

How Wood Shipyard Promotes Efficiency

THE Grant Smith-Porter Ship Co., Aberdeen, Wash., since its organization in June, 1917, has built up an efficient working force chiefly by gaining the confidence and winning the co-operation of its employees. When the company was organized, a few hundred workmen, most of them inexperienced at shipbuilding, were gathered together and from this small beginning the force has grown until at the present time there are over 1300 names on the company's payroll. On March 17, 1917, the first govern-

ment hull was launched, the MANADA, and since then 10 other vessels have taken the water from the company's ways. The character of the work done at the yard is indicated by the award of the shipping board's red pennant in May, 1918, denoting the second highest standing among the country's wooden shipyards, and of the blue pennant for the highest rank in the following month. The company maintains a club for its employees, called the community house, which is well patronized. The men have organized a band, baseball

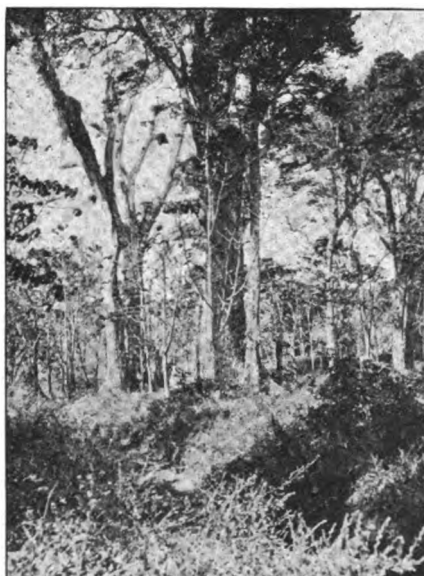
team, football team and bowling league.

The democratic spirit of the company is shown by the fact that the vessels launched, with two exceptions, were christened by wives and daughters of the company's employees. The following is a list of the vessels launched up to Nov. 5, 1918: MANADA, March 17; BANCROFT, April 28; BOXLEY, May 12; MORaine, June 8; WIHABA, June 27; ITANCA, July 4; AIKEN, Aug. 4, AN-THERA, Aug. 24; FORT SNELLING, Sept. 21; FORT SEWARD, Oct. 19; FORT STANWIX, Nov. 5.

Rare Woods Used in Shipbuilding---VII

By C. D. Mell

OF the many valuable timber trees of tropical America, the Spanish or cigar-box cedar is one of the yielding wood possessing greatest commercial importance. The tree is known locally by the Spanish-speaking people as *cedro*, *cedro macho*, *cedro de ramazon*, *cedro dulce* and *cedro hembra*. In the trade it is also called West Indian and tropical American cedar, because it is indigenous to all the islands of the West Indies and to the mainland from southern Mexico southward to Brazil. Owing to its extensive natural range of growth there appears to be a tendency in this tree to run into varieties, many of which assume the character of distinct species, and trees almost similar in appearance to the true cedar occur as far south as Argentina. No other tropical timber tree thrives naturally in such a great variety of soils as the Spanish cedar but it is probably most abundant in the deep, moist and rich soil of southern Mexico, where it is said to attain



CEDAR TREES IN THE FORESTS OF COSTA RICA

its best development for timber uses.

The hardest and most durable wood grows on the uplands of Cuba, Haiti and Trinidad. In the rich valleys and fertile mountain slopes of Cuba the tree attains large proportions, often reaching a height of 80 or 100 feet with a trunk diameter of 2 to 6 or more feet. The trees supply boards of such width that a single one is sufficient to make a door or a table top. The logs frequently contain from 3000 to 5000 board feet. The average run, where 15-inch logs are included, is about 700 board feet to the tree. Unfortunately, the trees develop large buttresses extending sometimes to the height of 6 to 10 feet from the ground, and often the best portion of the trunk of a tree felled for timber is left in the forest, because those who fell the trees invariably cut them above the root swellings.

Spanish cedar is noted for its strength, lightness, smoothness and stability. It will bear a greater weight

without breaking than that of any other wood with a similar specific gravity. Like that of second-growth hickory and ash, the wood of young trees is most esteemed as the fiber is stronger and more elastic. The best wood is said to be derived from trees between 40 and 60 years of age. At present the bulk of the logs coming into the market are from trees several hundred years old and from 3 to 5 feet in diameter. The wood splits with difficulty, although it works well and can be sliced into veneer to 1/80-inch in thickness.

Wood is Durable

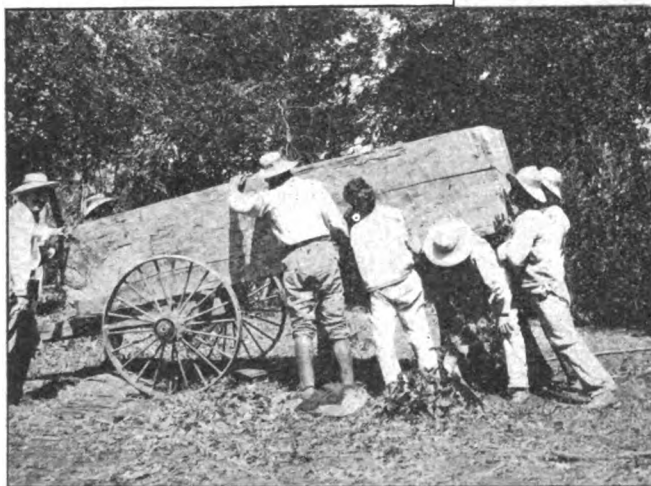
There is an aromatic oil in Spanish cedar which is said to repel insects and render it immune to wood-destroying fungi. The wood is durable under practically all conditions and has been reported to be proof against the attacks of white ants which are



Spanish cedar is employed for a great variety of special purposes for which it is always in the highest demand. It is regarded as the most useful wood in tropical America. The wood is often curiously figured and is capable of taking a good polish. For these reasons it is sometimes used by the cabinet maker.

Develop Light Aggregate for Concrete Ships

Investigations conducted under the auspices of the International Concrete Ship association, New York, have resulted in the development of a new form of aggregate whose use makes it possible to produce concrete ships which weigh only about two-thirds as much as formerly but whose structural strength is three times as great. These results were achieved by using cement clinker,



THE LOGS ARE FLOATED TO THE PORT OF SHIPMENT IN LARGE RAFTS. THIS IS SHOWN IN THE UPPER VIEW. THE ILLUSTRATION AT THE LEFT SHOWS HOW MAN POWER IS UTILIZED IN LOADING LOGS FOR TRANSPORTATION TO THE RIVER. AFTER THE TREES ARE FELLED THE LOGS ARE SQUARED. THE MARKS OF THE ADZE ARE PLAINLY SEEN IN THE VIEW AT THE RIGHT

so destructive to woods in the tropics. There are, however, no authoritative records showing that it is entirely immune to the ravages of these insects or to the toredo. All users of cedar and writers on timber seem to agree that the wood is durable when in contact with the soil and that it resists the action of the weather. The quality of withstanding the action of the elements is due probably to the presence of an oil in the wood.

Spanish cedar is not generally rated as a shipbuilding wood, although in tropical America it is highly esteemed for building small boats. Considering its lightness in weight and great durability in contact with water, it is difficult to understand why Spanish cedar has not been requisitioned more extensively in the past for boat building in the United States. It is of interest, however, to note that it has recently gained recognition in this country as a boatbuilding material, when more than 100,000 feet have been sold to one organization for making lifeboats. In the opinion of those who know Spanish cedar best there is no better wood extant for

this purpose, and it is believed that after its good qualities become more generally known the better grades of logs coming into this country will be requisitioned for boat construction.

Closely Related to Mahogany

Most architects and wood users in this country do not know that Spanish cedar is not a cedar at all; they think of it as a soft wood or conifer. This is a mistake. The true Spanish cedar is a broad-leaved tree and is closely allied to the mahogany which was at one time considered the king of shipbuilding woods. Spanish cedar closely resembles mahogany in many important respects only it is lighter in weight, which is a quality much in its favor for so important a use as boat building. Next to mahogany the cedar is the most valuable of all the tropical American trees. If the mahogany be regarded as the king of the forest, the cedar may easily claim supremacy as the queen. While mahogany is pre-eminently useful for fine furniture and interior trim, and for all purposes requiring great beauty and durability,

which can be obtained at any cement plant, in proportions of three of clinker to one of cement. The mixture after pouring, weighed 105 pounds per cubic foot and in a compressive test conducted seven days after pouring, broke at a pressure of 4863 pounds per square inch. In 28 days it broke at 9240 pounds. A density test showed 2.5 per cent moisture.

In making this concrete, the cement was ground to a fineness of 97 per cent through a 200-mesh sieve before calcining, and after calcining it was ground to a fineness of 95 per cent through 200 mesh. This cement was aged 60 days in the clinker and was used comparatively freshly ground. The aggregate was composed of hard-burned clinker, fresh from calcining, crushed and ground to take up the voids, and ranging from 1/4-inch to a fineness of 200 mesh. The concrete was mixed with 12 per cent water and was tamped hard. When using this mixture in a cement gun, 8 to 10 per cent of water may be used.

In order to produce still better results, the association recommends that after fine grinding, the aggregate be moistened and molded into uniform briquettes and dried in an oven prior to calcining, as this method results in its expansion to 10

times its original size, creating thousands of sealed voids and therefore making the aggregate lighter in weight. The number of sealed voids can be increased still further by add-

ing about 10 per cent of high carbon, pulverized coal.

The association now is conducting experiments to develop a cement lighter in weight than that now em-

ployed, in order still further to decrease the weight of concrete ships. Progress which already has been made indicates that this result will be achieved shortly.

Latest News from American Shipyards

THE composite steamer BALOSARO, third of six vessels being built by the Mobile Shipbuilding Co., Mobile, Ala., was launched from the ways of that company in the Alabama port recently. This is the third vessel sent into the water from this yard since Aug. 22, 1918. The keel of the BALOSARO was laid Jan. 2, 1918, and at the time of her launching, she was more than 70 per cent complete. Her tonnage is 3500. This company launched the BALINO, Aug. 22, and the MORGANZA, Sept. 29.

The keel of the first concrete tanker to be built at Mobile, Ala., has been laid in the yard of the Concrete Shipbuilding Co. The tanker will be of 7500 tons.

The Louisiana Shipbuilding Corp., Slidell, La., recently launched a 3300-ton composite hull which was christened BUCKHANNON. The machinery is being installed and it is planned to deliver the vessel to the Emergency Fleet corporation late in December.

The FUELOIL, third of a fleet of four 2400-ton steel tankers, was recently launched from the yards of the Alabama & New Orleans Transportation Co., at Violet, near New Orleans. These ships are being built for the Pan-American Petroleum & Transport Co. and will be used in carrying crude oil between Mexican and United States ports. They will carry 14,000 barrels of oil each. MEXOIL and PANOIL were the first and second, respectively, to be launched, and CRUDEOIL, the fourth and last of the fleet, will be completed early in January.

The Moore Shipbuilding Co., Oakland, Cal., plans to erect a floating drydock of timber construction to cost approximately \$1,000,000. Plans for the drydock are being prepared by Leland S. Rosener, San Francisco, and provide for a structure 425 x 126 feet. The drydock will be erected in the Oakland estuary by day labor.

The Pacific Marine & Construction Co., a California corporation, capitalized for \$1,000,000 has secured permission from the corporation commissioner of California to issue all of its capital stock to a Delaware corporation of the same name. The Scofield Engineering Co., of Pennsylvania has a contract from the Emergency Fleet corporation for the construction of concrete vessels which it is expected to assign to the Delaware corporation. In this way the California corporation will secure the contract for erecting the vessels which will be built at San Diego, Cal.

The navy yard at Mare Island, Cal., has enough work on hand for two years and will be enlarged, it is officially an-

nounced from Washington, following a meeting of the war cabinet at which it was decided that all warships under construction or contracted for would be completed.

The United States government has started dredging the west basin of Los Angeles harbor at San Pedro to make room for the \$1,000,000 drydock to be erected by the Los Angeles Shipbuilding & Dry Dock Co.

The Ross Construction Co., Sacramento, Cal., has been awarded a contract at \$151,275 for constructing a marine railway at the naval coaling station at La Playa, San Diego, Cal. The ways will be 700 feet in length with a cradle 300 feet, or large enough to accommodate small naval craft. The contract includes electrical equipment. The railway is to be completed by Nov. 1, 1919.

The Standard Shipbuilding Co., Wiscasset, Me., controlled by Boston capitalists, has stopped all work. The frame of one of six barges is in position.

The total tonnage launched in Maine during 1918 is estimated to be in vicinity of 300,000. Many builders anticipate a lively demand for schooners of moderate tonnage and light draft. That type will be constructed largely next year.

Four-mast schooner SALLY PERSIS NOYES, built at Harrington, Me., for Crowell & Thurlow, Boston, was launched recently. The vessel has a capacity of about 2500 tons and is commanded by Capt. Charles Gleasel, formerly of the schooner JANE PALMER.

Four-mast schooner CHARLES D. STANFORD was recently launched from the yard of the Bangor-Brewer Shipbuilding Co., Brewer, Me., and is owned by the builder. The vessel is the first to be built in Brewer since 1905. Her length is 171 feet and her net tonnage 650.

Joseph Supple, boat builder, plans the construction of a \$100,000 drydock on the waterfront south of the east approach of the Morrison street bridge, Portland, Oreg. The dock will be of the floating type and of cement construction.

The Emergency Fleet corporation is planning to build several modern drydocks on the Atlantic coast. The plans and specifications are complete for a floating drydock, shops and repair plant at Jeffries point, Boston. This work is to involve an expenditure of \$10,000,000. The corporation is also to construct a 5000-ton drydock to cost \$900,000 at Portsmouth, N. H., and also contemplates the building of an-

other drydock at Portland, Me., which will cost \$2,100,000.

The QUISTCONCK, the first standardized steel ship launched at Hog Island, has been taken over by the government. On her trial trip, this vessel logged 12.34 knots an hour although the contract speed was but 11.5 knots.

The Grays Harbor Motorship Corp., Aberdeen, Wash., recently launched the 4000-ton Ward-type steamship BROOKLAND. The vessel is 290 feet long, 49 feet beam and has a depth of hold of 28 feet.

The Pennsylvania yards of the Pusey & Jones Co., Wilmington, Del., recently launched the steamship HENRY CLAY, a 12,500-ton cargo carrier. The vessel was launched sidewise as was the INDIANAPOLIS, a sister ship launched July 4. These vessels are 455 feet long, 60 feet beam and 36 feet 8 inches deep. The CLAY is the eighth ship to be launched at the Pennsylvania yards, all of which have taken the water sidewise.

The Fabricated Ship Corp., Milwaukee, organized to construct 13 steel vessels for the government recently laid the first of seven keels now in the process of fabrication. Due to the epidemic of influenza, no special ceremony was observed as had been originally planned. The yard is located at the foot of Twelfth street, Milwaukee, on the former property of the Peitit Salt Co., between the north and south branches of the Menominee canal. The working force is at present 200, but this will be increased as soon as the construction of the hulls is in full progress. The company's contract calls for nine mine laying vessels and four river transports, each 172 feet long. The first vessel is to be delivered to the government on May 1, 1919, and one every 30 days thereafter.

Secretary Daniels of the United States navy has informed the officers of the Fore River, Quincy, Mass., plant of the Bethlehem Shipbuilding Corp. that sufficient work will be forthcoming to keep the Fore River plant and the Squantum, Mass., plant running at full capacity for the next three years. This announcement was recently made by J. P. Kennedy, assistant manager of the Fore River plant.

The St. Johns River Shipyard Co., Jacksonville, Fla., recently launched the MAYPORT, a 3500-ton Ferris-type ship which left the ways 95 per cent complete. The vessel was towed at once to the outfitting dock where work on the installation of the machinery is in progress. The MAYPORT is the third vessel to be launched by the company.

On the Coasts, Lakes and Rivers

What's Doing and Who's Doing It

Two Steamer Halves Lost on Way to Sea

By M. L. Shaner

THE bow section of the steamer **MANOLA**, formerly of Cleveland, and the forward section of the steamer **NORTHWEST** sank on their trip to the coast. The **MANOLA** was formerly owned by the Pittsburgh Steamship Co. and was recently reconstructed at Chicago for ocean service. She was cut in two at the Buffalo drydock and was lost on Lake Ontario near the Ducks at 1 o'clock on the morning of Dec. 3. She was being towed by the tug **MICHIGAN** of Buffalo when the accident took place. The men on the **MICHIGAN** heard cries from the bow section of the **MANOLA** and although the line connecting the two boats was cut immediately, the tug was unable to reach the **MANOLA** before she had sunk. A strong southwest gale was blowing at the time and it was snowing heavily. When the tug arrived at the spot where the vessel had gone down there were no signs of survivors. Among those lost on the **MANOLA** were Capt. Harry Pardee, formerly master of the **CODORUS** of the old Anchor line; E. L. Nielson, engineer, Walnut, Iowa; Otto Schnoor, handyman, Chicago; Herbert McQueen, cook, Buffalo; A. Lund, able seaman, Brooklyn; Ivor Johnson and Edward Mahoney, able seaman, Buffalo; Emil Ericson, Buffalo; Samuel Anderson, Buffalo, and William Lavis, Buffalo. The **MANOLA** was built in 1890. Her capacity was 3300 tons and she was 282 feet keel length, 40 feet beam and 24½ feet deep. She was taken over by the United States shipping board last winter. The bow of the **NORTHWEST**, which foundered in Lake Ontario about a week before the accident to the **MANOLA**, is in 175 feet of water according to the report received by the underwriters. Only two of the crew of the **NORTHWEST** were lost.

November was a record month for shipbuilding on the Great Lakes. During all previous months the Great Lakes district of the Emergency Fleet corporation has steadily exceeded all the rest of the United States in number of steel ships turned out. A special effort was made all over the country to make November a record month, but the Lakes district with 28 ships completed and delivered easily maintained and even increased its lead. This was 54 per cent of all the steel ships delivered in the United States and nearly 30 per cent more than in any previous month. During the 1918 season the lake builders turned over to the Emergency Fleet corporation 160 boats. Owing to ice conditions some of these will not be sent to salt water this year. The

steamers **CEDAR SPRINGS**, **LAKE GRANTON** and **LAKE FOUCHÉ** will be kept at Cleveland during the winter and some of the boats will winter at Lake Ontario ports. The three steamers which will remain at Cleveland are not included in the list of 160. Most of the lake yards will be kept busy until late in 1919 on Emergency Fleet corporation orders.

The forward section of the steamer **VAN HISE** started on her trip through the Welland canal during the early part of December. There was some question as to whether the **VAN HISE** should make the trip owing to the lateness of the season before the start was made. On Dec. 6, low water in the channel of the harbor in Buffalo caused the forward section of the steamer to strike bottom and two tugs worked on her all day trying to get her off. The rolling operation on the forward section, which took place on Thursday, Dec. 5, was successful, and the after section was rolled the following week. It, however, will remain in Buffalo until spring.

The steamer **HARRIET B** made a stormy passage from Marquette to Sault Ste. Marie only to fall into the sheriff's hands at the latter port. She arrived at the Soo on Dec. 6 and was seized at the locks by Sheriff Wallace Lundy in an attachment suit brought by Millard D. Olds, Cheboygan, Mich. The steamer was loaded with wood pulp for the Hammermill Paper Co., Erie, Pa. Mr. Olds claims a breach of contract by the Hammermill Paper Co. and sues for damages to the sum of \$30,800. The **HARRIET B** was to be held by the sheriff until a proper bond is furnished by the company to secure her release.

The building of the steamer **LAKE CATHCOON** by the Buffalo Dry Dock Co. for the government has established a new shipbuilding speed record. When the **CATHCOON** was announced finished and ready to go into commission on Dec. 7, just 14 days had elapsed since the date of her launching. The best previous record for this work had been 17 days. The **LAKE CATHCOON** was launched on Saturday, Nov. 22. She is full canal size like the other ships built along the lakes by the Emergency Fleet corporation. It is not believed she will be sent to the coast this year as the Lachine canal is frozen and three of these ships are already fast in the ice at this place.

Two French mine sweepers, the **CERISOLEI** and the **INKERMAN**, were lost

on Lake Superior during the first week in December or the last week of November. On Nov. 23, the two missing vessels and the **SEBASTOPOL**, also a mine sweeper, left Fort William, where they were built, and started across Lake Superior. The **SEBASTOPOL** arrived at the Canadian locks on Nov. 26, but before that she had lost sight of her companion vessels. She went on to Kingston, Ont., where she docked to await news of them. Up to Dec. 9 none had arrived, however. The ships are the property of the French government and were bound for European waters to assist in clearing the seas. The crews of the two vessels numbered about 80 men. Van H. Wilson, of Buffalo, was pilot on one of the missing trawlers. He formerly was second officer on ships of the Great Lakes Transit Corp.

The Hon. Dr. Reid, minister of railways for the Dominion of Canada, will at once proceed with the completion of the Welland canal. This is part of the reconstruction program planned by the dominion government. At the outbreak of war the estimated cost of the work embraced in the four main contracts under which construction was being carried on was \$20,000,000, of which \$12,000,000 has already been expended. This does not cover, however, other estimated necessary expenditures in contemplation for land, cement, structural steel bridges, lock gates, valves, etc., amounting to about \$8,000,000, of which about \$4,000,000 has already been expended. It is expected that about 800 men will be employed on the work this winter preparatory to the reopening of construction in the spring when about 4000 will be employed. Renewed work on the Trent canal will also offer work to several hundred men.

The C. & B. and the D. & C. steamship lines made their last trips of the season during the last week in November. Storms held up the boats at various times during the latter part of the season. On Dec. 1 they all went into winter quarters.

The United States lake survey office reports that the hull of the old steamer **GEORGE H. VAN VLECK**, while being towed down the Detroit river, sank northeasterly of Ecorse, Mich., almost completely blocking the upper entrance to Ecorse channel. The hull is lying headed northwest by west, with its stern about 2100 feet northwest ¼ north from Fighting island north light, and about 60 feet northerly of a line through the

red float lights marking the southerly side of the channel. The wreck will be lighted by the owners.

* * *

The barge NEOSHA, formerly a steamer of the Gilchrist fleet, was recently

rebuilt at Manistee, Mich., preparatory to being sent to the coast. She is owned by the Northern Transportation Co., Baltimore, Md.

* * *

Capt. Fred W. Light, Perry, O., mas-

ter of the barge MARCIA, died Saturday, Nov. 16, at Toledo, where he was laying up his boat. Captain Light had been with the Pittsburgh Steamship Co. since it was organized and he sailed several steamers of the big fleet.

Up and Down the Pacific Coast

ONE of the most costly marine disasters in years occurred in Seattle harbor when the Japanese steamer MEXICO MARU rammed and sank the American full rigged ship A. J. FULLER. The latter was lying at anchor, laden with a full cargo of canned salmon, approximately 50,000 cases. The FULLER had just arrived from Uyak, Alaska, and had not discharged. The mishap was due to fog. The loss is estimated at more than \$600,000, as the ship was valued at \$200,000 and her cargo at more than \$400,000. The FULLER lies in 200 feet of water and salvage is not thought possible. The Osaka Shosen Kaisha, to which the MEXICO MARU belongs, has recently had a series of mishaps in Puget sound. Late in July the CANADA MARU, inbound from Japan, went ashore at the entrance to the Straits of Juan de Fuca and narrowly escaped being a total loss. This vessel is now being repaired at a cost of \$500,000 and will soon be ready for service again. The BORNEO MARU, of the same fleet, returned to Tacoma, Wash., recently with her steering gear disabled after being about 1000 miles on her return to Japan.

* * *

Forerunner of a rejuvenated Vladivostok trade, the new American steel steamer CADARETTA has left Seattle for the Siberian gateway. She is laden with a full cargo of railroad material which has been lying in storage at local terminals for more than a year. The CADARETTA was built in Portland, Oreg., and was turned over to the Robert Dollar Co. The equipment, part of which is aboard the CADARETTA, was purchased by Russia prior to the revolution and when conditions became unsettled, shipments were stopped. The present sailing is an indication that the United States is preparing to extend substantial aid to the Russians at this time. It is understood that the steamer SANTA CRUZ, of the Grace fleet, will be in Seattle shortly to load a cargo of quartermaster's supplies for Vladivostok. Other steamers are expected to be assigned to this trade shortly and it is believed this commerce will soon be a large factor in Puget sound's foreign trade.

* * *

With the coming of peace, lumber trade between Puget sound and the east coast of South America, is becoming a reality. The Norwegian schooner J. W. CLISE recently sailed for Buenos Aires and two motor ships have just been chartered for this trade. Heretofore, the lumbermen of the Pacific Northwest have catered largely to the markets of Peru and Chile, but with the Panama canal in service and motor ships available, it is expected that the markets of Brazil and Argentina will develop. The

freight rate to Buenos Aires and River Plate ports is \$60 per thousand feet.

* * *

Famous as the vessel around which Jack London wove his famous *Sea Wolf*, the little schooner HALCYON met a tragic and romantic end on Nov. 11 in the worst storm that has swept the Aleutian islands in years. The HALCYON, owned by the North Pacific Sea Products Co., was well anchored in the harbor of Akutan. She broke adrift and was carried out to sea by the great gale. She has not since been seen and it is certain she was dashed to pieces on the rocky shores of some adjacent island.

* * *

Efforts to revive the formerly extensive trade between Puget sound and

The 1918 Index

THE complete index of THE MARINE REVIEW for the calendar year 1918 is now available for distribution to subscribers. The remarkable changes during that period in marine practice, in both a technical and commercial sense, make the index for the past year of more than ordinary value. Subscribers desiring to secure a copy may do so without charge by writing direct to the circulation department of THE MARINE REVIEW, Cleveland.

the Hawaiian islands are being made with requests that the shipping board assign suitable vessels for this route. Until two years ago this commerce was large and rapidly growing. However, the steamers were withdrawn for more essential war routes and since then there has been no steamship service. For several months, wooden steamers built on Puget sound have been dispatched to the islands by the shipping board, but they have not returned here, being assigned to the San Francisco-Hawaiian trade. Puget sound interests are strongly urging that these vessels be returned to Puget sound and used to rebuild the trade that the war temporarily wiped out.

* * *

Indicating the extent of the oil trade through the Seattle gateway, the East Waterway Dock & Warehouse Co., at its Seattle plant, handled \$36,000,000 worth of oriental nut and vegetable oils during the last eight months. A recent inventory showed 500,000 cases of oil in storage at Seattle and in addition more than 4,000,000 gallons were in the tanks at the terminal. The oil moves to eastern market by the trainload. This trade is an outcome of the war, as it former-

ly went to Europe and Atlantic ports via the Suez canal.

* * *

With the signing of the armistice, the government has diverted vessels intended for the nitrate trade and this tonnage is now being used to carry flour from Puget sound and the Columbia river to Atlantic ports and Europe. This diversion has helped to relieve a situation that was recently serious for the flour millers, who were handicapped by lack of space. Several of the auxiliary wood steamers built for the French government by the Foundation Co. are loading full cargoes of flour at Seattle for French ports.

* * *

After a rest of 10 years lying embedded in the sand of Seattle harbor, the hulk of what was formerly the German steamer MARIECHEN has been floated. The vessel was long since dismantled but the rise in the value of steel attracted attention to the hull and it was sold several months ago. Now the hull has been patched up and the new owners are seeking insurance in the hope of towing it to Vancouver, B. C., where it is expected to cut the steel hull to pieces and use the material in new ships.

* * *

With the transfer of all of the berthing charges of off-shore ships to the cargoes, the port of San Francisco will be open to the world on a free-ship basis on Jan. 1, 1919. Besides this complete revolution of the system of port revenues which have been in effect since San Francisco became a harbor under government control, the state board of harbor commissioners is planning to spend \$2,000,000 within the next 12 months to bring the port to a higher state of efficiency. A definite program has been outlined by the commission which includes equipping the piers with up-to-date labor saving devices, extending existing piers to the pierhead line, the concentration of coastwise shipping at specified piers with accommodations for passengers, the extension of the oil terminal facilities on Islais creek, new docks and warehouses especially fitted for overcas business and other additional warehouses and shippers' facilities. Under the change in the port revenue system, existing cargo tolls will be raised from 5 cents a ton to 15 cents. Regular steamship lines are to be assigned to permanent berths only upon the condition that they maintain not less than eight regular sailings a year or have at least 12 unscheduled vessels in the trade. Various rules which are expected to minimize congestion on the piers are to be put into effect.

* * *

The highest tide ever known in the history of San Francisco occurred on

the morning of Nov. 18 as a result of a run-in of 6 feet 7 inches of water meeting the flood from the river. It had been raining and blowing a south-east gale all night and the storm continued through the morning. Over a half inch of rain fell between 9 and 10 o'clock. This augmented the flood which reached its height at 11 o'clock. At that time the water was backed up under the wharves and spurted up in fountains from the drains. Steamers at the docks towered above these structures until their gang-planks were almost perpendicular. When the tide turned it went out through the heads like a millrace. The steamer **PRESIDENT**, which normally makes about 15 knots, went out with the ebb and passed the lookouts at a 24-knot clip, disappearing so quickly that many believed her to be a destroyer.

* * *

As a result of the investigation of the loss of the United States shipping board

steamer **BLACKFORD**, a 3000-ton vessel which foundered 125 miles north of Cape St. Lucas in a hurricane on Sept. 26, government inspectors have revoked the license of Capt. T. A. Peterson, master, and Chief Engineer George E. Waxham has had his license suspended for six months. Other officers of the **BLACKFORD** was suspended for three months. Investigation disclosed that the vessel was leaking badly when departing from Seattle and had taken 4 feet of water when leaving San Francisco. It was charged that the officers were derelict in their duty and jeopardized the lives of the crew by failure to report the condition of the vessel at Seattle and San Francisco and later by not seeking shelter from heavy seas in the Gulf of California, or in the lee of Cerralbo island when engine trouble developed.

* * *

The United States destroyer **RINGGOLD**

succeeded in equalling the best record ever made by a vessel of her class on her trial trip recently. The destroyer, built at the Union Iron Works unit of the Bethlehem Shipbuilding Corp., maintained a rate of 36 knots for a little over four hours. The vessel is equipped with turbine engines which are capable of turning 3600 revolutions a minute. A reduction gear is affixed which permits the propeller to make 452 revolutions a minute or better. For two hours during the trial run the propeller averaged 470 revolutions. Startling tests were made of the vessel. While traveling at full speed ahead, she was halted in almost her own length, 300 feet. Going at full speed astern, she was stopped, the engines reversed and in an incredibly short time she was going ahead at 20 knots an hour. The **RINGGOLD** is the fifth destroyer built for the government at the Union Iron Works, but none of her sister ships was able to equal her speed.

Along the Atlantic and Gulf Coasts

THE port of Boston is congested with shipping under the new rule that 10 per cent of the overseas trade shall be allotted that port. During several weeks there have been daily departures of ships averaging 7500 tons capacity and, from the present outlook, traffic will continue in that ratio for some time to come. With the closing of the St. Lawrence river to navigation ships trading between Montreal and Europe were routed through Boston. Grain exports have been heavy since the war ended and will increase in volume from now on. Traffic has been diverted to Boston from New York and Portland, Me., and the movement is to continue, say experts, as long as the terminals are able to offer quick and economical dispatch.

* * *

Capt. G. D. Robinson, formerly in charge of the coast guard tug **WINN-SIMMET**, was in command of the new steamship **COHASSET** when that vessel left the Fore River plant of the Bethlehem Shipbuilding Corp., Quincy, Mass., on her endurance tests.

* * *

W. H. Hamer, chief engineer of the port of Auckland, New Zealand, and James Marchbank, engineer of the harbor board of Wellington, New Zealand, who are in this country to study port problems, particularly those relative to handling coal and oil, visited Boston recently.

* * *

Capt. C. R. Calhoun, master of the American steamship **FELIX TAUSSIG**, died recently in France. He was in employ of Crowell & Thurlow, Boston, and leaves a family in Philadelphia. Until a year ago Captain Calhoun was in command of an ocean tug.

* * *

At the 165th annual meeting of the Boston Marine society the following officers were elected: President, James Gurney Jr.; vice president, J. G. Crowley; treasurer, Samuel Pray; trustees, J. P. Manson, W. F. Humphrey, L. H.

Richards, J. Clifford Entwisle, E. B. Atwood, H. H. Litchfield, J. L. Manson, E. A. Pease, P. H. Crowell.

* * *

The New England Fuel & Transportation Co., Everett, Mass., is unloading soft coal from steamers at the rate of 7200 tons in less than six hours.

* * *

The British 3-mast schooner **EVOLUTION** has been sold by D. W. Simpson, Boston, to Captain Kohler, New York. The vessel was built in Nova Scotia, in 1889 and rebuilt last year. The price paid was about \$12,000.

* * *

Hope for the 4-mast schooner **EAGLE WING** and her crew of nine men has been abandoned. On Aug. 10 the vessel left Bermuda for New York and has not been reported since. The schooner was designed for the New England coal trade and ran for many years between Chesapeake bay ports and Boston.

* * *

The Boston barkentine **JOHN S. EMERY**, Captain Fickett, inaugurates the post-war lumber trade between Boston and South America, having sailed for Rio Janeiro with a cargo of 900,000 feet of white pine.

* * *

After 74 years continuous operation the Eastern Steamship Lines, Inc., has withdrawn steamers between Boston and Portland, Me., and announces the service will be resumed next spring. The Boston-New York service maintained by steamers **CAMDEN** and **BELFAST** has been withdrawn for the winter. The line now has a freight service to New York. Before the war the system was maintained by 30 vessels, many having been requisitioned by the government.

* * *

The British steamship **CASCAPEDIA**, Captain Williams, enroute from Boston for St. John's, New Foundland, was burned at sea. Many of the passengers landed at Halifax, Nova Scotia, while the British steamship **BELLEROPHON**, which rescued 35 of the crew, landed

them at Falmouth, England. The **CASCAPEDIA** had about 900 tons cargo, all of which was lost, the ship having been set on fire at the last moment as a menace to navigation. The Nova Scotia Steamships, Ltd., owner of the vessel, announces that another ship will be secured.

* * *

Two new steam trawlers, **OCEAN** and **RIPPLE**, built on the Great Lakes for the Bay State Fishing Co., Boston, left for the coast shortly before navigation closed.

* * *

Considerable discussion over the real value of the new industrial canal which is being dug to connect Lake Ponchartrain with the Mississippi river at New Orleans, eventually reached the priority commission of the war industries board recently, and the canal project was given the formal stamp of approval by that commission. Opponents of the canal declared that, inasmuch as there is only 14 feet of water in Lake Ponchartrain, the canal would be useless for shipbuilding, it being impossible to remove the ships—except into the strong current of the river where there are no quiet places for outfitting—through the lake to deep water in the Gulf of Mexico. The opposition to the canal at first was believed to have been led mainly by representatives of the railroad interests, but it later developed that the critics of the project came from many and varied industries and corporations as well as from the land transportation lines. The matter has now been settled however, and the people of the city and state are watching with interest the \$25,000,000 experiment.

* * *

The United States employment service has opened a bureau for stevedores and marine workers on the waterfront in New Orleans.

* * *

The Mississippi river commission under Brig. Gen. W. H. Bixby, of St. Louis, its president, recently completed an inspection trip of the river from St. Louis to New Orleans.

Equipment Used Afloat and Ashore

Boat Releasing Device—Pneumatic Hammer—Plate Tightener—Snap Switch

THE problem of getting boats away from a vessel when the command to abandon ship is given is a serious one as accidents often happen owing to the inability of the crew to cast off the falls after the boat is waterborne. A few seconds' delay is often fatal for even in this brief interval a heavy sea may throw the lifeboat violently against the side of the ship which generally crushes the boat or throws the occupants into the water.

The device shown in the accompanying illustration was designed after much study to develop a simple

taniously through the medium of a rod operating radially which is placed along the bottom of the boat. This rod is actuated by a substantial handle.

It is claimed that the device is thoroughly practicable and that numerous exhaustive tests carried out under the supervision of the Emergency Fleet corporation, the United States steamboat inspection service and Lloyd's met the most exacting requirements. In these tests a steel ships' lifeboat, 26 feet 6 inches long with a 6-foot 3-inch beam, was ballasted with sandbags to give a total weight of 7600 pounds.

In these tests the boat fully waterborne was instantly released. Next the boat was hoisted well above the water and jerked severely by dropping the falls one or two feet and checking them abruptly and then the boat was released before she was waterborne.

In another test the bow was lifted as high as possible above the water without submerging the stern and the boat was jerked abruptly from a stationary position to a considerable speed, about seven miles an hour, and released while in motion.

Several other tests were carried out to prove the practicability of the device after which the gear was taken from one end of the boat and sent to the Drexel institute, Philadelphia, for a destruction test. In this test the hook fractured above the pin at 59,600 pounds.

The whole apparatus has positive control and can be unhooked by hand if necessary while the falls can be hooked on by one man.

Pneumatic Hammer

The machine shown in the accompanying illustration is a self-contained pneumatic hammer recently developed by H. Edsil Barr, Erie, Pa. The machine was designed to eliminate hand work on light forgings, tool-dressing and other smith work.

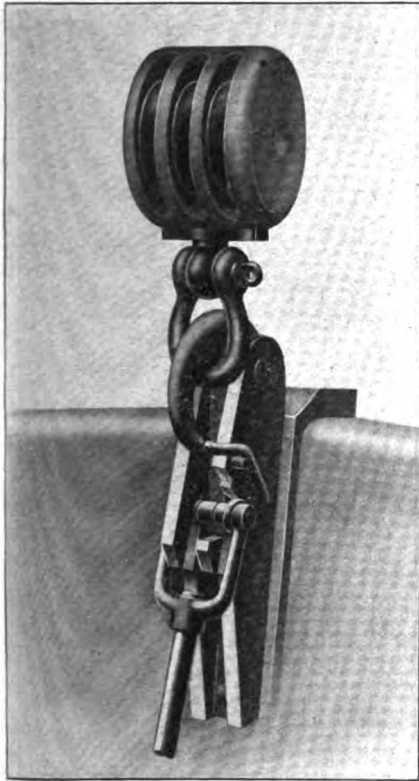
This hammer is a one-man tool and, owing to the fact that it is a self-contained unit, independent of outside mechanical operating means, it can be readily removed from place to place as occasion requires. This feature is of practical value in shipyards and other industrial plants where it is often necessary to do light forging some distance from the regular blacksmith shop. In portable service, the hammer is mounted on short skids, 16 inches long by 6 inches square.

The frame of the machine comprises a heavy anvil, cast solid, and a rigid box housing which is made integral with the anvil. The housing supports the cylinder and other working parts. A deep gap is provided in the housing back of the dies which insures ample room in operation. To facilitate handling long stock in welding, etc., an opening runs clear through the housing, back of the dies.

The cylinder is bored and reamed

to size and is located in place by means of a planed keyway. The object of this is to insure permanent alignment. Thus, if the cylinder has to be removed for repairs, it is a simple matter to mount it accurately in place again.

The cylinder ports are made large enough to insure quick operation and the main valve is readily reached through the chest cover. The chest also houses the throttle valve. The piston rod gland is made in halves which permits the piston and rings to be examined above the cylinder

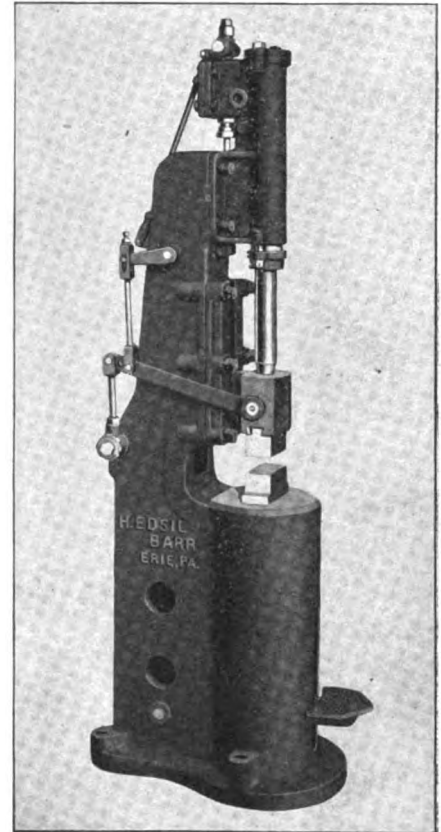


QUICK ACTING BOAT RELEASING DEVICE

method of releasing both bow and stern falls simultaneously at an instant's notice. It is a product of the Steward Davit & Equipment Corp., New York. The device consists of a substantial housing in the upper part of which is pivoted a swinging hook that is passed through the shackle of the lower fall block. A keeper pin, shown at the right touching the end of the hook, is for the purpose of keeping the shackle in place when the tackle is not hauled taut.

At the lower end of the housing that carries the hook is machined a cam slot in which a roller, placed between the ends of a clevis, operates. When the clevis is pulled downward the roll, guided by the slot, passes the end of the hook causing it to fly upward which leaves the shackle free to disengage, thus instantly releasing the boat.

Both clevises, that is one at either end of the boat, are actuated simul-

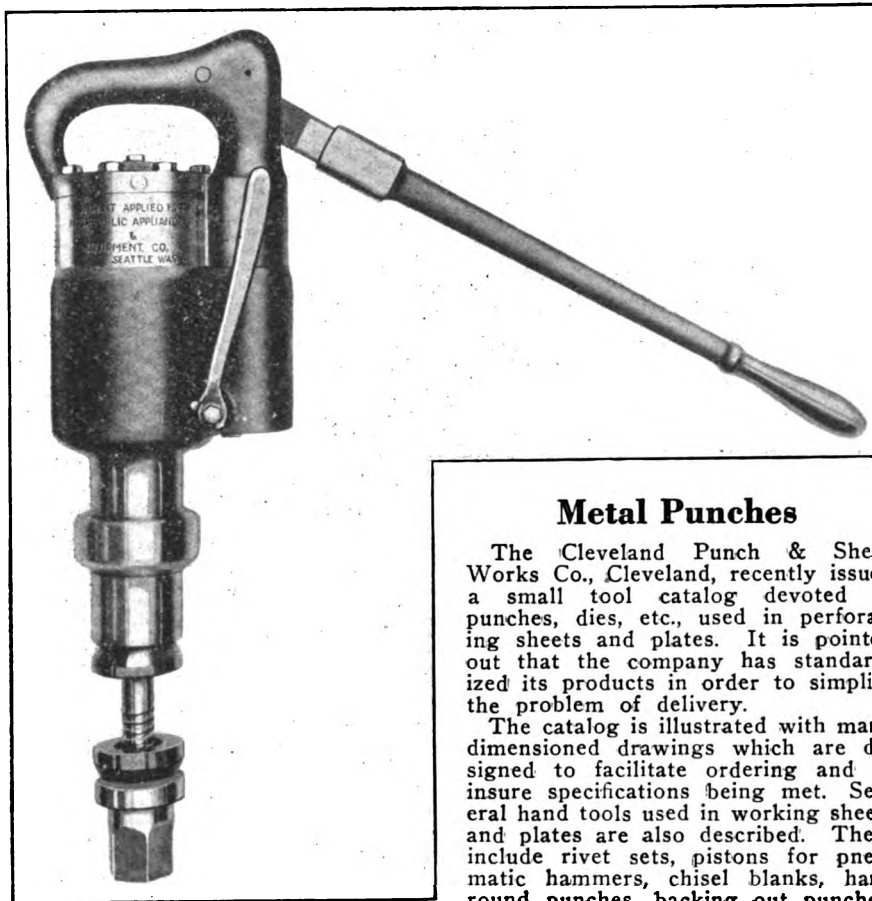


PNEUMATIC HAMMER FOR SHIPYARDS

without removing the ram head. The piston and piston rod are made integral from vanadium alloy steel and the rod is made exceptionally large in diameter to offset the strain caused by constant work. The piston rings are gray iron and are finished in the sides and faces by grinding.

The ram head and guide shoe are made in one piece from an open-hearth steel forging. The ram has a long taper fit on the rod to insure it against loosening in service. The main guides are of the half-V type and run down quite near to the striking point. The dies are tool steel, die tempered, annealed and oil-treated. The upper die is keyed to the ram while the lower die is doweled to the anvil. The dies can be removed readily in case where it is necessary to substitute ones of special design.

The main valve is of the D-slide



HYDRAULIC PLATE TIGHTENER

type and is operated from the ram. The valve is actuated rapidly by this means and the piston is cushioned on the upstroke independent of the valve gear. The throttle valve is made of bronze and is of the taper plug type to insure reasonably long wear without attention.

The hammer operates on either steam or air. Air, however, is said to be the best operating medium when it is available. The reason for this is that the tool is ready for instant service without warming up. The best pressure for effective work is from 80 to 100 pounds per square inch.

How it Works

The hammer is started by pressing down the foot treadle and the speed and force of the blows are regulated simply by the amount of pressure on the treadle. With the correct air pressure, 250 blows a minute can be struck continuously. To strike single blows a pressure and release on the foot treadle is required.

It is pointed out that a simple adjustment of the valve gear permits extra high speed in operation together with quick, short blows which is said to be a valuable factor in working such materials as ornamental iron, copper, bronze, etc. The tool requires no adjustments in working on any thickness of metal within its range which is 2 inches thick. Stock $3\frac{1}{2}$ inches thick can be passed clear of the housing back of the dies.

Boston, it is announced, is one of the ports selected for debarkation of troops returning from France.

Metal Punches

The Cleveland Punch & Shear Works Co., Cleveland, recently issued a small tool catalog devoted to punches, dies, etc., used in perforating sheets and plates. It is pointed out that the company has standardized its products in order to simplify the problem of delivery.

The catalog is illustrated with many dimensioned drawings which are designed to facilitate ordering and to insure specifications being met. Several hand tools used in working sheets and plates are also described. These include rivet sets, pistons for pneumatic hammers, chisel blanks, hand round punches, backing out punches, rivet busters, hand rivet sets, cold cutters, drift pins, barrel pins, markers, wrenches, portable hand punches and hand screw punches.

An interesting feature of the catalog are several specification sheets. These are perforated to enable them to be easily detached and contain line drawings of punches and dies on which dimensions and quantities are easily filled in.

Plate Tightener

With the object of reducing the time and labor necessary in bolting up ship plates preparatory to riveting them, a Seattle shipfitter, James P. McBride, originated the device shown in the accompanying illustration. It is called a plate tightener and is being manufactured by the Hydraulic Appliance & Equipment Co., and distributed by the Shipbuilder's Machinery Co., both of Seattle. Mr. McBride's original invention was perfected by Archer B. Clark, president and manager of the Hydraulic Equipment company, who applied the well known hydraulic principle, as used in jacks and presses.

The invention is a modification of a hydraulic press and its operation is comparatively simple. The piston running from the cylinder is threaded at its outer end which is put through holes in the plates to be drawn together. The nut shown on the lower end of the piston is tightened slightly and the pump set in motion by the handle shown at the right in the illustration. This causes the piston to move which brings the plates tightly together in position for riveting.

It is estimated that the appliance exerts a pressure of from 20 to 60

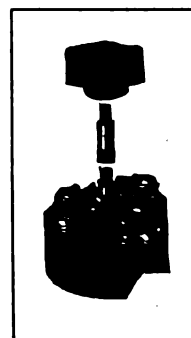
tons. Compared with the older method of bolting up by hand, it is stated that the machine does the work formerly requiring the services of 20 men. The device is that it is portable and can be handled by one man and a helper. It measures 22 inches overall. It is said to take the spring out of the plates, due to the high pressure, and to eliminate the necessity for heating large plates preparatory to fitting them in place. The inventor claims that the appliance should speed up production of the average ship by at least five days.

Snap Switch for Marine Service

The snap switch shown in the accompanying illustration is one of the devices made by the Bryant Electric Co., Bridgeport, Conn., for marine purposes. The base is of molded composition with the ratchet plates molded in. The form of construction eliminates the liability of mechanism becoming loose.

While this ratchet plate must necessarily be steel, in order to withstand the severe service expected of such a part, it is copper-plated to prevent rusting. The music-wire spring,

which actuates the mechanism, is also copper-plated. This switch is made in both single and double pole, and for either type, a $\frac{3}{8}$ -inch extension stem for handle is provided where watertight covers are employed. The bases are molded of such a size, $1\frac{3}{8}$ inches on centers, as to permit standard screw spacings for attaching to the box. The diameter of the switch base is $1\frac{3}{4}$ inches. The height to the top center base proper is $1\frac{1}{8}$ inches.



SNAP SWITCH

As the illustration shows, a groove is provided on the back of the base which is large enough to permit of running a separate circuit through the box. Two of these switches may be mounted in a standard 4-inch box.

Pneumatic Tools

The Independent Pneumatic Tool Co., Chicago, is issuing a folder describing many types of pneumatic tools for use in shipyards. These include air-driven drills, tapping attachments, wood boring machines, portable air-driven grinders, sand rammers, pneumatic hammers and pneumatic holder's-on. The folder is illustrated and complete descriptions of each tool are included.

The Shepard Electric Crane & Hoist Co., Montour Falls, N. Y., recently opened an office in the New Lexington building, Baltimore. The object of this office is the better to serve the company's increasing business in southern territory. The office is in charge of Norman P. Farrar who for many years has been district manager of the company's Philadelphia territory.